THE AMERICAN BOTANIST

A QUARTERLY JOURNAL OF ECONOMIC AND
ECOLOGICAL BOTANY

EDITED BY WILLARD N. CLUTE

Volume XXII

JOLIET, ILL.
WILLARD N. CLUTE & CO.
1916

CONTENTS

ILLUSTRATED ARTICLES MARKED WITH A STAR (*).

NOTE AND COMMENT

Vol. 22. No. 1 Whole Number 108

THE AMERICAN BOTANIST

FEBRUARY, 1916

25 Cents a Copy; $1.00 a Year

WILLARD N. CLUTE & CO.
JOLIET, ILLINOIS

The American Botanist

A Quarterly Journal of Economic & Ecological Botany

WILLARD N. CLUTE, EDITOR

SUBSCRIPTIONS.—The subscription price of this magazine is $1.00 a year or $1.50 for two years, payable strictly in advance. Personal checks on small or distant banks must contain ten cents for collection fees. The magazine is issued on the 20th of February, May, August and November.

BACK NUMBERS.—Volumes 1 to 10 inclusive consists of 6 numbers each, Vols. 11 to 13 of 5 numbers each and all later volumes of 4 numbers each. The first 18 volumes may be had for 75 cents a volume, or the set will be sent for $9.00. A full set contains 2312 pages.

THE FERN BULLETIN

In 1913, at the completion of its twentieth volume, **The Fern Bulletin** was consolidated with this magazine. The back volumes average more than 100 pages each, and since they cover the entire formative period of American Fern study they are invaluable for reference. The majority of new forms discovered in recent years have been described in its pages. First six volumes out of print. A set of vols. 7 to 20 will be sent for $7.00. An extended description of the contents of the volumes may be had for the asking.

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207 WHITLEY AVENUE, JOLIET, ILL.

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A large tree fern—*Cibotium Menziesii.*

THE AMERICAN BOTANIST

VOL. XXII JOLIET, ILL., FEBRUARY, 1916 No. 1

Every clod feels a stir of might
An instinct within it that reaches and towers
And groping blindly above it for light
Climbs to a soul in the grass and the flowers.

—Lowell.

THE TREE FERNS OF HAWAII

By Vaughan MacCaughey.

THE tree ferns are undoubtedly a declining race. Long ago the humid epoch of their dominance waxed and waned. The coal beds reveal the deathless delicacy of those ancient fronds. The slate strata are sprinkled with the leaf-prints of the primitive plant-world. Few sights stir the botanic imagination as does a cabinet of fern fossils. Each fragment visualizes an earth-epoch antedating today by immeasurable vastnesses of time. The cinematograph-reel of paleobotany whirls back, and flashes strange pictures of illimitable jungle-forests—skirting the world mountains, girdling the Poles, covering great areas of China, Australia, and many other lands. The coal and oil fields of today are the herbaria, the cemetaries, of those spacious Carboniferous swamps.

Recent studies in paleobotany have necessitated extensive revisions of current ideas concerning the Carboniferous fern-flora. The prevalent conception of the arborescent pteridophytes as constituting the major part of the swamp-forest vegetation, has been demonstrated to be erroneous. Many of the

supposed fern fossils have proven to be the leaves and stems of primitive gymnosperms. The apparent decadence of the pteridophytes is thus not so great as was once commonly believed. The tree ferns probably never comprised a dominant element of the Carboniferous forests.

The arborescent ferns are today widely distributed throughout the humid tropics. They give a distinctive appearance to many of the equatorial rain-forests. In favored regions, like Hawaii, they form pure stands of considerable magnitude. Australia, New Zealand, Malaya, Ceylon, Africa, Central and South America, all possess fern forests. The important genera are: *Cyathea, Alsophila, Hemitelia, Dicksonia, Thyrsopteris, Cibotium,* and *Balantium.*

Although associated in the popular mind with a hot-house atmosphere and a gorgeous tropic background, in reality the tree ferns manifest a considerable range of thermal adaptation. They literally extend from the steaming jungle, "where the blazoned, bird-winged butter-flies flap through," to the icy rim of the Antarctic. A number of the Tasmanian and New Zealand ferns are annually subjected to very low temperatures. It would appear that the critical factor governing the geographic distribution of the tree ferns is not primarily a high temperature, but high atmospheric humidity fairly continuous throughout the year. The perennial crown of gigantic fronds is vitally dependent upon a moist atmosphere. It cannot long withstand drought, nor thrive in a xerophytic habitat.

Small clumps and groves of tree ferns are abundant on the mountain slopes of all the larger islands of the Hawaiian archipelago, but the finest stands are limited to the island of Hawaii. This is the largest and youngest island of the group, in fact its area (four thousand square miles) is greater than the combined area of the others. Hawaii's large size, its great volcanic domes rising to nearly fourteen thousand feet, its

extensive lava flows, and its long windward coast line, all combine to give this island a remarkable series of ecologic zones. Within the range of few miles one may run the full climatic gamut of the hymn "From Greenland's icy mountains to India's coral strand." There is conspicuous diversity in annual temperature and precipitation in the various zones and districts, from tropic to frigid, and from sunburnt desert to dripping rain-forest.

The fern forests lie along the windward and middle slopes, in the cloud-zone of fairly continuous humidity. Puna, Hilo, Ola'a, parts of Hama-kua and Ko-hala, and wet districts on Mauna Kea and Hu-ala-lai are the chief areas occupied by the tree ferns. The total stand may be very roughly stated at eighty to one hundred square miles.

Of the seven genera and three hundred species of the tree ferns (Cyatheaceae), only one genus, *Cibotium,* with three endemic species, occurs in the Hawaiian Archipelago. The fern forests of Hawaii are composed of *C. Menziesii, C. Chamissoi* and *C. glaucum;* the latter rare and of minor importance. *Cibotium* is from the Greek, "a little seed vessel," and has reference to the conspicuous indusia. Menzies was the botanist with Vancouver's historic expedition to Hawaii in 1792-94; the botanist Chamisso accompanied the Russian expedition under Kotzebue (1816).

Menzie's tree fern, called *hapu i'i'i* by the Hawaiians, is the largest native species. In favorable localities it attains regal proportions. The brown spongy trunk is frequently two or three feet in diameter, and rises without branching to a height of twenty or twenty-five feet. From its summit springs a magnificent canopy of huge, tri-pinnate fronds; this splendid fountain of greenery being ten or twelve feet high and twenty to twenty-five feet in diameter. However, with all its glory of crown and magnitude of trunk, the *hapu i'i'i* never reaches

the stately proportions of the justly famous Norfolk Island tree ferns. These belong to the species *Alsophila excelsa,* and are frequently from sixty to eighty feet in height.

Chamisso's tree fern, *hapu,* is more abundant, and more widely distributed than its larger relative. It occurs on all of the high islands of the archipelago, and is plentiful in the humid lower and middle forest zones. Its trunk is usually but six or eight feet in height, and its crown never equals the magnificent dome of the *hapu i'i'i.* Under very favorable conditions the trunk may rise to fifteen feet, but this size is exceptional.

The popular notion that tree ferns are tender and easily-damaged is derived from kinds quite different from the hardy *hapu.* The tree ferns possess great vitality, and will rejuvenate themselves after repeated injuries. The Hawaiian *Cibotiums* are able to maintain themselves in many districts overrun by cattle, goats and swine. These half-wild herbivores have irreparably damaged much of the native woodland, but have not so seriously injured the tree ferns. The wild pigs are particularly obnoxious by reason of their rooting habits, and undoubtedly destroy considerable quantities of young fern trees. The pig hunters well know that fern groves are the favorite haunts of their game.

The large petiole-bases, and the terminal bud, (which is as big as a man's head), are densely covered with a thick matting of golden-brown hair. This soft, silky substance is called *pulu* by the natives. Under the microscope the individual hair is seen to consist of a series of flat, thin-walled cells, large at the base and tapering to a slender apex. In the early days *pulu* was exploited commercially as a stuffing for pillows and mattresses. Several hundred tons were annually exported to California, in addition to the large local trade.

The natives who gathered the *pulu* displayed the same lack of foresight as did the sandalwood cutters of an earlier Hawaiian era. No thought was given to the conservation of the supply. Whole groves of splendid *hapu i'i'i* were felled in order to more easily gather the golden harvest. A few machete-strokes were less laborious than climbing the tree. This recklessness ruined many of the finest groves, and cause a rapid shrinkage in the supply. The industry was further curtailed by the inherent inferiority of the *pulu* itself. The hair is brittle and weak-jointed, and in usage soon breaks into fine pieces. The mattress becomes hard and lumpy, and its elasticity cannot be restored. The rapid deterioration of *pulu* products was soon discovered by the trade. The exploitive industry dropped forever from the commercial world, to the great good fortune of Hawaii's beautiful fern forests.

Humorous stories are told of the tricks used by the *pulu*-mattress makers to stimulate trade during the decadent days of the industry. A secretly-hired emissary would be sent to a hotel or lodging house; he would pretend to desire lodging for several weeks; then, just before registering, he would inquire, "does the bed have a *pulu* mattress?" If the reply was to the contrary, as was frequently the case, he would emphatically state that he never slept on any save a *pulu* mattress; express high indignation at the shortcomings of the hostlery; deliver a fluent harangue on the virtues and excellences of *pulu;* and stormily depart. The enlightened manager, fearful of losing other *pulu*-preferring guests, would thus be inveigled into ordering some of these short-lived mattresses.

These dense bud-and petiole-coverings of silken brown hair are not confined to *Cibotium,* but occur on other genera of tree ferns. The *pulu* of a javanese *Dicksonia* is exported to Europe in considerable quantities as a surgical styptic. It is of interest to recall in this connection the fabulous mediaeval stories of the "Scythian lamb" or *Agnus Scythicus.* The tree fern that gave

rise to these marvellous tales is an Asiatic Cibotium, *C. Barometz*. According to the mediaeval herbalists, this wonderful creature had wool, flesh and blood, and a root extending from the navel into the soil. "The plant was said to resemble a lamb in every respect, but grew on a stalk about a yard high, and turning about and bending to the herbage consumed all within reach, and then pined away with the failure of food until it died." In 1725 an enterprising student actually examined a "lamb" and declared it to be only the rhizome of a large fern, covered with *pulu* and bearing petioles. It had been placed in an inverted position on the museum shelf, the better to simulate the body and legs of a quadruped.

The fern trunk is somewhat expanded or spreading at butt and at crown. Its least diameter is about midway between ground and terminal bud. The spongy exterior is often covered with a dense, coarse matting of short, appressed aerial roots, which turn downwards and are more or less closely intermingled with the fibrous material of the stem. On old trunks these multitudinous roots, living and dead, form a dark coating, sometimes several inches in thickness. In Honolulu the Japanese gardeners and florists make considerable use of the fibrous trunks for the construction of fern-boxes and hanging baskets, and for orchid pots. They have depleted the local woodlands of the older *hapu*.

The upper portion of the trunk is disfigured with the old, hard, persistent petioles, that droop at various angles. The dead leaf blade is soon whipped off by wind and weather, but the woody stalks long remain. Occasionally one will find a fern trunk more or less completely cased in dead foliage. This condition is most marked with ferns growing under semi-xerophytic conditions.

The central part of the trunk is made of spongy, starchy parenchyma, traversed by fibrous vascular bundles. In ancient

Tree ferns form a dense and unbroken undercover.

Hawaii, the younger stems and trunks were used in time of famine for food. They were cut into sections a few feet in length, and thoroughly steamed in the underground oven, *imu*, or baked in hot ashes. The farinaceous interior was then removed and eaten. In the vicinity of Kilauea there are many volcanic steam cracks. These are turned to practical use for steam-cooking the *hapu* stems, which nowadays are fed to swine. The starchy core is quite nutritious, and under the unique local conditions of free fuel from Vulcan's workshop the *hapu* has proved to be a practicable and profitable hog-food.

In certain parts of Hawaii where the tree ferns are abundant and the soil soft and water-logged, the trunks are used for the construction of corduroy roads and trails. The coarse fibres

cake down into a tough spongy matting, that is serviceable for several years without repair. Occassionally fences are made by stacking up like cord wood three or four foot lengths of fern trunk. The terminal buds, and numerous lateral buds, sprout vigorously, and soon the spongy wall is clad in a mantle of green fronds.

The fertile leaves are readily distinguished by the conspicuous bivalved indusia. These form a thick beaded rim along each margin of the segments. The indusium is coriaceous, and several millimeters in diameter. Both the inner and outer valve is free from the leaf segment. The spores are produced in enormous quantities, and are pale brown in color.

The finest fern forests in Hawaii are on the very wet slopes of the Kohala Mountains, but those most accessible to the traveller are in the vicinity of the Crater Kilauea. These occupy an area of many square miles, at 1000-4000 feet elevation. The *ohia lehua* (*Metrosideros polymorpha*) is the dominant hardwood tree of this district. Its slender gray trunk rises to a height of sixty or eighty feet. Under its fine-leaved, open canopy the tree ferns form a dense and unbroken undercover. Both species occur here, the *hapu* the more abundant, the *hapu i'i'i* the more conspicuous by reason of its stature and spread. *Cibotium glaucum* closely resembles the *hapu* and has the same geographic distribution, but is rare. According to Hillebrand, forms occur which are intermediate between the two species.

The *lehua* and the tree ferns give the Kilauea region its distinctive aspect, but a number of other trees and shrubs occur scatteringly through the forest. Chief among these are,—*Suttonia Lessertiana, Cheirodendron Gaudichaudii, Ilex Sandwicensis, Rubus jamaicensis, Broussaissia arguta, Stenogyne calaminthoides,* and several *Cyrtandras.* The soil is a thick, moist vegetable mold, overlaying ancient lava flows. In the forested district are many pit craters and steam cracks.

An interesting account of the interrelationship of the tree fern and the *lehua* is given by Rock: "Both the fern and the tree are often found growing together to such an extent that it is difficult to distinguish the tree trunk from the trunk of the fern. The natives have an idea that the *Hapu i'i'i* is the mother of the *Ohia lehua*. The seeds of the *Ohia lehua* often germinate in the crowns of the tree ferns, sending down their roots along the very fibrous, often water-soaked trunk. In time the fern begins to die and the *Ohia lehua* is left standing with stilt roots of often 15 feet or more in height, after which the real trunk of tree commences."

The fern forest has an inimitable charm and a distinctive beauty. In architecture and atmosphere, it is unique. There is no other forest canopy that feathers the blue sky with such noble fretwork. Its plumy frond spray is an incarnation of the humid air, the gentle breezes, and the tranquil filtered sunshine of its environment. There are no noisy wind-tossed leaves upon its velvet aisles; there are no crackling twigs to startle the wanderer in these green lit corridors. The sweet notes of the *i'iwi* bird tinkle bright as sunbeams through the fern domes; the brilliant scarlet of its plumage contrasts pleasingly with the great green feathers of its home. Her radiant fern groves will long remain among Hawaii's noblest treasures.

PLANT WASTES

By Miss Alice L. Gookin.

THE losses to the plant through transpiration, exudation, and in other ways is often of considerable importance. Transpiration means the passing off of water from plant surface in the form of water vapor. The water vapor escapes only at tiny perforations in the cutin of the leaf, called stomata, and through these perforations 95% of all the water a plant gets is lost in the vapor state. Guttation or exudation, is the loss of water in the liquid state. An observant person walking in a garden very early in the morning after a dry, warm night could hardly fail to notice drops of water at the ends of the veins of certain leaves. This moisture is caused by the slow oozing of a watery fluid from the leaf and is known as guttation water. By placing a fuchsia under a bell jar, these drops can be plainly seen exuding from the tips of the leaves. The exudation takes place through water pores scientifically known as hydathodes. These pores are larger than the stomata and fewer. They are located at the ends of the side veins in dicotyledons, such as the nasturtium, and at the tip of the leaf of monocotyledons as in corn, wheat and grass. The drops of water on grass tips on the lawn after a dry, warm night are not dew drops, but this water of guttation.

The hydathode, unlike the stoma, has no guard cells but is a pit lined with two or three rows of living cells. In one sense it is a widely open stoma beneath which is a reservoir filled with water driven in by filteration. The cavity is separated

from the end of the water tubes by a few intermediary cells. The guard cells close the stomata in the dark and during the night the accumulated water escapes through the open doors of the water pores. Some plants, like the geranium, exude their moisture through tiny hairs. The fungi exude from the general surface.

Exudation water differs in another respect from the water of transpiration. Being in the liquid state, it carries with it many of the plant foods in solution and therefore has a composition similar to sap. As a general rule, the drops collect slowly, yet from the tip of a leaf of Elephant's Ear, 25 drops have been known to fall in one minute.

From the young leaves of certain Aroids, the family to which the Jack-in-the-pulpit belongs, water is sometimes ejected in a fine spray to a distance of a few inches. Guttation is especially common in shade plants that live in conditions which do not favor transpiration.

There is a certain kind of guttation which is commonly called "bleeding". This is the losing of sap due to cutting or injury by man, such as improper pruning. In some cases this bleeding is effected purposely, as in the case of the sugar maple and the century plant. In the sugar maple, bleeding is resorted to, to obtain the great commercial product, maple sugar. The sap of the maple represents the surplus of the tree's winter storage. In the warmth of early spring the roots begin to absorb large quantities of soil water. This dissolves the sugar and both rise in the vessels. By tapping at this time large quantities of sap may be extracted. This loss is not felt by the trees because just at this time they are sending out leaves which are able to manufacture their own food.

Sugar making begins with the upward flow of the crude sap in February or March and continues until the buds begin to swell. Trees twenty or thirty years old are considered the most

productive, though there are instances of trees which have yielded sugar every year for a century and are still vigorous and fruitful. The tree which produces the maple sugar of commerce is called for this reason the sugar maple. It ranks among the finest of American forest trees. It frequently rises 70 feet without a branch and spreads its leaves to the sunlight 120 feet above its base. It is this tree which is tapped with a ¾ inch augur, to a depth of two to six inches. The sap flows through a spout inserted in each auger hole and drips into a tin pail suspended under the wound. It is a slow process, about seventy drops falling in a minute, but it continues ceaselessly and in three weeks it may amount to 25 gallons. The sap is evaporated in copper boilers, treated with a little lime to destroy the bitter taste, and poured into pans to harden. From 25 gallons of sap about 4½ pounds of sugar are made.

The century plant, (*Agave Mexicana*), surpasses even the sugar maple in the quantity of matter extracted by artificial bleeding. These plants are so big that you could not crowd the smallest of them into a hogshead. They have leaves from 6 to 8 inches thick, which sprout up from the ground to the height of 10 to 12 feet. Inside the leaves, there is a green cone as big around as a peck measure. When the plant is ripe this cone is cut out leaving a bowl which will hold about two gallons. Into this queer bowl the sap runs from the leaves in streams. Each plant produces from 8 to 15 quarts of juice a day and this continues for six months. At first the juice is quite sweet and clear as spring water, but it begins to ferment in a very few hours and within a day has turned into an intoxicating drink known as "pulque", the Mexican national beverage.

Some of the minor losses through exudation are those of volatile oils, gums, and resins. To the presence of the volatile oils is due the fragrance of many flowers and fruits, notably

those of the mint and geranium. The plant acids also belong to this group. Acids are usually retained in the plant, and yet, not being in the general protoplasm and not in the seat of activity, are said to be secreted rather than excreted and are therefore waste to the plant. The oils in the orange and lemon are secreted in specialized glands well down in the epidermis, while the acids accumulate in the pulp outside of the seed vessels and away from the growing seed. Just as citric acid is accumulated in lemons, oranges, and allied fruits, so are oxalic and malic acid in apples and pears, and tartaric acid in the juice of grapes. In this group, we find alcohol obtained by fermentation resulting from the action of enzymes on the acids and sugars. Tea is the watery extracts of tannin from the tea leaf. These substances are waste products as far as the plant is concerned. They have no nutritive value to the plant; in fact are often poisonous.

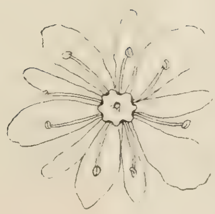
Milky juices are very common excretions from plants. The Milkweed family is distinguished by a milky fluid which is stored in its vessels and exudes when cut or crushed. Upon exposure to the air this milky latex coagulates and forms, upon drying, a sticky, elastic mass which, in some plants is sufficinently abundant to furnish the India rubber of commerce. The rubber tree is a very large tree somewhat like the English ash and grows to a height of 60 feet. They are never found in groups. When a tree is about 20 years old, it is tapped. The tapping is done from the ground as high up as a man can reach and sometimes higher. This hole is not bored with an auger as in the tapping of the maple trees, but gashed with a hatchet just deep enough to cut the bark but not the wood. As the rubber gatherer draws out the hatchet a milky white fluid oozes forth. The tapper then inserts a little cup below the gash, fitting it by a slight cut in the bark. He makes at least three such cuts in each tree. Since these trees grow far apart the tapper must cover a great deal of ground in his daily work.

Each man has his own trees to care for ranging from 60 to 150 trees according to the distance between them, and this number is called a path or a road. The size of a rubber plantation is estimated by the number of paths or roads it contains. The roads are mere footpaths which lead through the forest from one rubber tree to another.

The sap flows most freely in the morning. By noon the rubber man comes back to empty the milk into a gourd or bucket. Only a few tablespoonfuls can be gathered from each wound in a day, and if he can gather two quarts of milk from his path he thinks he has done very well. The next process is turning the milky sap into the rubber of commerce. The sap coagulates upon exposure to the air. The fine rubber is cured by smoking, and the best rubber comes from the sap which is smoked a few hours after it is gathered. It will harden best under the influence of smoke. The fuel is usually palm nuts because they make a dense smoke. The sap is poured into a broad bowl and a long paddle is thrust into the milk. It is held in the smoke a minute and turned rapidly so that no drop of the precious sap may fall into the fire. This is repeated until a mass of rubber as large as a six-pound ham is formed. It is then cut through one side and the paddle is taken out. Now it is ready for shipment.

The solid loss to plants of winter twigs is incalculably more than is commonly supposed. Before leaf fall, all the trees form their winter buds in the axils of the leaves. After severe storms, twigs bearing these buds are broken off and scattered here and there and this is a loss to the tree. A solid loss of great commercial value is cork. Cork is the outer layer of bark of an evergreen or live oak, which grows in Portugal and Spain. When the tree is about seventeen years old, the first stripping of the bark takes place. Thereafter it is stripped every eight years until it is 150 years old. This operation is

performed in spring when the sap is beginning to rise. It is advisable to put back the cork thus stripped, fastening it around the trunk by means of wire and leaving it there for a time; otherwise the trees are very liable to injury from dry, hot winds. Wrapping the trees in this way also prevents a second development of the worthless outer cork. The new cork is of great value. It is deposited at the rate of .04 to .12 inch annually. The first harvest is taken when the layer of cork has reached the thickness of an inch.



THE BIRCH HARVEST

By W. M. Buswell.

WHILE walking through the forest in late fall or winter, one may often notice that in many places the snow is thickly covered with small winged seeds and four-pointed scales from some nearby tree. If we happen to be familiar with the trees of our northern forests, we recognize these as the seeds and scales of the birch. Few, however, would know which of the four common species of birch had showered the white forest carpet with its fruits, for the trees from which they come are often many rods away and seemingly invisible.

I suspect the birds are responsible for many of these birch showers, for the fruit remains on the trees for some time and the birds probably know that such crops, like grain crops, should be harvested before falling to the ground. Since the fruiting branches of the birch are usually out of reach from the ground, it would be a considerable task to collect fruit from the tree, though the birds find it easy and many of them are fond of the seeds. While sitting under some white birches one day in October, a large flock of goldfinches were busy stripping the cones to get the seed, and so fast did they work that the continuous shower of loosened scales sounded like rain as they dropped on the leaves under the trees.

We often hear these birch scales compared to flying birds, yet there is only one species with truly bird-like scales. The scales of the small gray birch (*Betula populifolia*) do resemble a flying bird, as the illustration will show. The scales of the

white birch (*B. papyrifera*) are the ones most often seen and are probably the ones referred to in this connection though they have much less resemblance to birds, either when falling from the trees or lying on the ground.

Seeds of gray, white, black and yellow birches, from top down.

The locality as well as the season should be considered in attempting to identify the birch fruits, for we rarely find all four species growing in the same place. Gray, white, and yellow, birches are found in the same locality and black, white, and yellow, may be found together, but gray, and black birches I have never found growing naturally in the same locality. Black birches (*B. lenta*) grow along the fertile river valleys while the gray birch seems to prefer a dry gravelly soil.

The fruits of the white, gray, and yellow, birches ripen in autumn and may remain on the trees well into winter, while the black birch fruit is ripe early in the summer and most of the fruit will be off the trees when that of the others is ripe. The scales of the yellow birch (*B. lutea*) are entirely different from other birch scales and have no resemblance to a bird. They are more like a flower petal with a long narrow base and wide, three-lobed tip. They are nearly twice as wide as the others also. The scales of the white and black birches are most alike in size and shape, but the tip of the white birch scale is narrow and pointed, with a wider base, and the wings usually have a backward curve toward the base. The scales of black birch have short, often blunt tips, as wide as the base but shorter, and the wings have a forward slant.

A birch shower in the fall or winter may originate in either the white or gray birch, but if both trees are present, a comparison of the scales will be sufficient to distinguish them. In a gray birch district, the scales (which are very small compared with the others) and their birdlike form will identify them. The seed of the gray birch is very narrow, the wings lighter in color and each two or three times as wide as the seed. That of the white birch is broad and oval with wide, pale yellow transparent wings, each wing about the width of the seed and not narrowed toward the base as in the black birch. The seed of black birch is broad and oval with wings narrowing toward the base making seed and wings together somewhat heart-shaped. Yellow birch seeds are oval, or nearly round with wings about half as wide as the seed. The gray birch is sometimes called white birch in books, though I seldom hear it called that in speaking of the tree. The bark has a smoky appearance, more of a gray than a white. Whatever the value of the birches may be when worked up into lumber or firewood, they all add much to the beauty of the forest, while growing.

OSWEGO TEA IN THE GARDEN

By Adella Prescott.

AMONG the wild flowers that may be easily grown in gardens, perhaps none is more attractive than the Oswego Tea (*Monarda didyma*), a showy member of the mint family that brightens our swamps and brooksides during the late summer with its graceful heads of bright, yet soft red flowers. It is beloved of landscape architects who are obsessed with a desire for solid blocks of color, because there are few flowers of that particular shade. But it loses all its poetic grace when too broadly massed and is much more effective scattered among shrubbery in a natural way, being massed very lightly if at all. It delights in rich, moist soil and partial shade but will grow after a fashion almost anywhere, though it is naturally much shorter when growing in dry soil, sometimes being scarcely a foot tall, while in low, damp woodlands it may reach quite three times that height.

But its greatest charm (for the writer at least) is its attraction for humming birds, who seem to find the nectar in the long tubes flavored quite to their taste and come many times a day to lunch on the dainty food. If the flowers are near a porch or frequented garden seat, the tiny birds will become so tame that they will alight on a twig to rest between sips with no appearance of fear. The cardinal flower is also a favorite with humming birds and may be planted effectively in front of the mint, thus giving variety that even to birds is the spice of life. Both of these plants may be raised from seed, but as the cardinal flowers insist on moisture yet "damps off" very readily, the problem of keeping it wet and dry at the same time is sometimes a perplexing one and not easily solved.

A USEFUL WILD FRUIT

By Charles Francis Saunders.

SOME years ago, when visiting an old Franciscan Mission in Southern California, I cut a joint from one of the plants of a cactus hedge planted there generations ago by the Missionaries, and, bringing it home to Pasadena, set it out in my garden. It was of the Mexican species, *Opuntia Ficus-Indica*, the Indian fig or prickly pear, famous for its pleasant flavored, pyriform fruit. My single slab has now become a good sized plant and has proved an interesting addition to the garden, both because of its lovely flowers and its luscious fruit. The latter ripens in September, and, when mature, is 2 to 2½ inches in diameter by about 3 inches long, and of a pale straw color.

The outer surface of the "pear" is dotted at intervals of about half an inch with tufts of tiny bristles which, if touched even lightly, transfer themselves to the picker's fingers to his great annoyance. When handling the fruit, therefore, it is well to wear a stout glove; but, when growing high, it may be gathered, as is the custom of the Mexicans, with a pole to the end of which a nail is fixed transversely, acting like a hook. With this the fruit is spiked and pulled loose. The bristles are then removed by brushing with a bunch of grass or a piece of burlap, and with a knife a section is cut off each end of the "pear" and a narrow slice made vertically down one side. Then, by pressing back the enveloping rind at the vertical slice, the edible interior is neatly released. This is a juicy, sweet, refreshing pulp, about the size of a duck's egg, and only inferior to an equal amount of watermelon in the fact that it is pitted with numerous small, hard seeds, which are best spat out.

By pruning off the lower joints as the plant grows, the prickly pear may be trained into the form of a small tree, and is thus occasionally treated in the gardens of our Southwest. The plant as found growing wild on old Mission lands is sometimes procumbent as well as upright. Old plants are wonderfully prolific of fruit. I have counted thirty-four "pears" on a single joint. The Burbank spineless varieties in cultivation are similar to this naturalized child of Franciscan days in California, but of course the absence of spines and spicules makes the cultivated fruit more convenient to handle. The Mission Fathers introduced this species and another with red fruit, *Opuntia tuna,* both for hedge purposes and as a food item for their dusky protegés.

THE FLOWERS OF JAPAN

ONE may safely assert that no garden, large or small, in the United States of America is without its something "japonica". True, not all the plants bearing the name are strictly native of Japan, for the ignorance of botanists and others has resulted in many plant names being misnomers,—but that is another story. To the horticulturalist of this country, Japan is of peculiar interest, for not only has it furnished our gardens and greenhouses with a host of invaluable plants, but it is the only country of which the first fruits, horticulturally speaking, came direct to the United States. The gardens of this country secured the plants of most lands through Europe, and not only exotic plants, but a large number of North American native plants also. With Japanese plants, the case is different, thanks to Dr. G. R. Hall. It is well that garden lovers of this country should treasure the name of this gentleman for the plants he introduced,—*Lonicera Halleana, Magnolia stellata, Malus Halleana,* and others—are indispensibles. It was in March, 1862, that Dr. Hall returned from Japan and handed over his

rich collection to Samuel Parsons at Flushing, Long Island, for propagation and distribution. But previous to this, Francis Parkman of Jamaica Plain, Boston, had received a consignment of plants from Dr. Hall, and among others was the famous *Lilium auratum* which flowered for the first time in America in July, 1862. In the early sixties, Thomas Hogg visited Japan in the interest of Samuel Parsons and introduced, in 1865, many plants, including *Magnolia obovata*.

Another American, Prof. W. S. Clark, who went from Amherst College in the early seventies, sent, in 1876, seeds of many valuable plants, such as *Magnolia kobus, Cercidophyllum Japonicum, Syringa Japonica, Actinidia Polygama*, etc. In the Arnold Arboretum, many fine specimens raised from his seeds are growing today.

Three Englishmen, John Gould Veitch from early spring to autumn, 1860, Robert Fortune from the autumn of 1860 to the summer of 1861, Charles Maries from 1877 to 1880 collected extensively in Japan and each added to our gardens treasures beyond price. During the same period and in the early eighties, various foreign amateurs in Japan sent to their friends in Europe such valuable plants as *Vitis Coignitiae, Prunus Sargentii, Rosa multiflora*, and *Rosa Wichuriana*.

The pioneer work was supplemented by Prof. Charles S. Sargent, director of Arnold Arboretum, who visited Japan in 1892. His predecessors in Japan had enjoyed a virgin field, but as an offset to this, Sargent had the advantage which the full knowledge of the subject gives. He knew not only the Japanese plants already in cultivation in the Occident, but was also fully acquainted with the whole forest flora of Japan, and the result was a great number of beautiful and hardy trees and shrubs added to our gardens. He introduced, among other plants, all the Japanese deciduous oaks, certain horn beams, birches, alders, and many other valuable plants. In fact, this journey was the most fruitful in results of any undertaken in

Japan. The flora of Japan is very rich in ornamental trees and shrubs and the majority of the deciduous plants and nearly all the conifers have proved perfectly hardy and amenable to cultivation in the gardens of New England.—*From an article by E. H. Wilson in Gardeners' Chronicle of America.*

REPRODUCTION IN TREES

ALTHOUGH the nurserymen make use of suckers and cuttings for the quicker multiplication of certain species, every tree in its natural habitat produces seeds and is reproduced by them. The flowering of our forest trees is a phenomenon that does not, as a rule, attract attention, but their fruiting or seed bearing becomes patent to anyone who visits the woods in autumn. A tree has lived many years before it is capable of producing seeds. The seed bearing age is different in different species; thus the oak begins to bear when it is between sixty and seventy years old; the ash between forty and fifty; the birch and sweet chestnut at twenty-five years. Some produce seed every year after that period is reached, others every second, third, or fifth year; others, again, bear fitfully, except at intervals of from six to nine years when they produce an enormous crop. Most tree seeds germinate in the spring following their maturity but they are not all distributed when ripe. The birch and aspen for example retain their seeds until spring and these germinate soon after they have been dispersed.

The seed contains sufficient nutriment to feed the seedling while it is developing its roots and first leaves. We can, of course, go further back in starting our observations of the life progress of the monarch of the forest. We can dissect the insignificant greenish flower of the oak when the future seed, the acorn, is but a single cell, a tiny bag filled with protoplasm. From that early stage to the period when the tree is first ripe for conversion into timber, we span a century and a half—

equal to two good human lives—and yet the oak is but at the point at which a man attains his majority. The oak is built up after a process by which man attains his full stature. It is a process of multiplication of weak, minute cells which become specialized for distinct offices in the economy of the vegetable community which we call a tree. Some go to renew and enlarge the roots, others to perfecting that system of vessels through which the crude fluid from the roots is carried up to the topmost leaf, whence after undergoing chemical transformation in the leaf laboratory, it is circulated to all parts of the organism to make possible the production of more cells. Each of these has a special task and it becomes invested with cork or wood to enable it to become part of the bark or the timber or it remains soft and develops the green coloring matter which enables it, when exposed to sunlight, to manufacture starch from carbon and water.

The tree, as we have indicated, gets its food from the air and the soil. The rootlets have the power to dissolve the mineral salts from the soil in which they ramify, some authorities believing that they are materially helped in this respect, so far as organic matter is concerned, by a fungus that invests them with a mantle of delicate threads. However that may be, the fluid that is taken up is not merely water, but water plus dissolved mineral matter and nitrogen.

At the same time that the roots are absorbing liquid nutriment the leaves, pierced with the thousands of little stomata or mouths, take in atmospheric air which is compounded chiefly of the gases nitrogen, oxygen and carbon dioxide. The leaf cells containing the green coloring matter, chlorophyll, seize hold of the carbon and release the oxygen. The carbon is then combined with the fluid from the roots by the vital chemistry of the leaves and is circulated all over the system for the sustenance of all the organs and tissues.—*From an article by W. B. Beach in Tree Talk.*

NOTE *and* COMMENT

Dormancy in Seeds.—The seeds of nearly all of the wild plants in the Temperate Zone have a distinct period of rest and usually will not grow if planted as soon as ripe. In the seeds of cultivated plants, this tendency is less marked, having been weakened by many years of selection. After a dormant period of a few months, most seeds are ready to resume growth, but a few require a much longer period of rest. Some persist in the dormant condition for years, though given every condition that other seeds require for growth. Unfavorable conditions may retard the sprouting of any seed, unusually low temperatures, being especially effective. It is reported that under low temperatures, wheat may remain dormant for several centuries. In the case of seeds which refuse to grow under the most favorable conditions, several causes for the prolonged dormancy are known. In some plants, even when the fruit is ripe, the embryos within are so undeveloped that they cannot sprout at once, but must first complete their growth. In this class are the seeds of ginkgo and several of the true flowering plants. In other species, the seed coats are so hard as to exclude the needed moisture for long periods. As might be expected, all seeds of this kind do not sprout at the same time; it depends upon how long it takes for sufficient water to soak in. Other hard seed coats retard germination by preventing the swelling of the embryo. If the embryos of such seeds are taken from the seed coats they will grow at once; otherwise they may remain dormant for several seasons. The seeds of *Alisma plantago* are of

this type. Some seeds have coats that exclude oxygen and other gases and thus hinder the growth of the seedling. For a long time it has been known that certain seeds will not grow while exposed to light and that others are equally sensitive to darkness. These various delays in sprouting, though at first glance apparently harmful to the species, are not always so. If every seed grew the first season, it is quite possible that all the plants might be destroyed. A few seeds held over to other years gives the species several chances to survive. In such species, the seeds give a distribution in time similar to the distribution in space usually resulting from the production of such structures.

Identifying Plants by Chemistry.—At last, species making by fiat seems to be going out of fashion. It has been discovered by E. T. Reichert of the University of Pennsylvania that species and varieties of both plants and animals are sharply distinguished from one another by the structure of their molecules, and are thus easily identified by chemical means. Starch in plants, for instance, is known to consist of carbon, hydrogen and oxygen in six, ten and five parts, respectively. This gives a large number of atoms which conceivably may be arranged in a vast number of different positions and still have the chemical formula for starch. In animals, the haemoglobin or red coloring matter of the blood may theoretically exist in more than a million different forms and still be haemoglobin. When tested in various ways, the haemoglobin from each species reacts differently, and by means of these reactions, the student is able to recognize genera, species and even varieties. The study of starch in plants has given equally remarkable results. Each property of the starch grain, whether it be manifested in peculiarities of form, size, hilum, lamellation, fissuration, or reactions to chemical reagents, appears to be a specific character, thus allowing of the certain recognition of species; in fact, the author says, "It

seems obvious that we have found a strictly scientific basis for the classification of plants and animals."

Rainfall Due to Forests.—Much has been written for and against the theory that forests affect the rainfall without any very definite conclusions having been reached. Instances are on record where the removal of the forests have caused the gradual drying up of a region, but this was ascribed to the accepted fact that forests retard the evaporation and run-off and their removal naturally affects the moisture. Whether they increase the precipitation is entirely another matter, and one that has never been definitely settled, though opinion seems pretty much against it. Long continued experiments in France, however, show that the average rainfall over a forest compared to that over adjacent fields is as 100 to 76. If further proofs of this nature are found, we shall have to modify our ideas as to the relation of forests and rainfall. There is still another and seldom considered way in which trees affect precipitation, namely by the condensation of fog and dew. In foggy weather the condensation is quite noticeable, but even when it is clear, more or less dew forms on trees and though the deposit for a single night may measure the merest fraction of an inch, in the course of a year it forms a considerable amount. Estimates based on the amount of dew deposited on a certain number of leaves in one night would indicate that the annual dewfall may be equal to a rainfall of nearly 30 inches—more than many agricultural regions receive in an entire year.

Migrations of the Bobolink.—The bobolink, being a lover of damp meadows, has for many thousands of years been shut off from our Pacific States by the barrier of the arid lands. At the present time, however, the progress of irrigation has established throughout the region fertile spots by way of which the birds can cross. Small colonies, therefore, are beginning to nest each summer on the western side of the

dry country, almost to the coast of the Pacific. Apparently, however, the birds continue to migrate by their old route, going first north on their former track and then turning west instead of cutting straight across by the nearest way.—*Guide to Nature.*

QUINOA.—One will look in vain for the word quinoa in the ordinary dictionary, yet this is the name of a plant that is highly valued in certain parts of the world as a source of nourishing food. The quinoa plant belongs to the goosefoot or pigweed family (Chenopodiaceae). Practically all the plants in this group have insignificant flowers and the different species are often regarded as mere weeds, but it must not be forgotten that several are ordinarily cultivated as food plants. It is to this family that the beet, spinach, chard, orache and New Zealand spinach belong. The foliage of all of these is used as a pot-herb and several wild species serve as well, notably the lamb's quarters or redroot (*Chenopodium album*). The quinoa plant (*C. quinoa*) may also be used as a pot-herb, but it is chiefly valued for its large seeds which are ground into meal and baked in small cakes. The plant is a native of the Andes from Chili to Peru and is occasionally found as far north as Mexico. It grows two or three feet high and has considerable resemblance to the common pigweed. It may be added in this connection that the seeds of several species of *Chenopodium* are used in medicine, especially those of Mexican tea (*C. ambrosioides*) and worm-seed (*C. anthelminticum*).

ABSURDITIES IN NOMENCLATURE.—The complications which sometimes develop as a consequence of the changing of plant names by the scientist are sufficiently absurd to be amusing. A good illustration of this may be found in the name of a little fern, *Polypodium polypodioides*, which when translated means a polypody that looks like a polypody! Another good specimen culled from the pages of a recent American publication is *Unifolium bifolium monophyllum*. Students of dead

plants and the dead languages will observe that the generic name means one-leaved, the specific means two-leaved and the varietal one-leaved. The odds seem to be two to one that the plant has a single leaf, but knowing the ways of the name-tinkers one can never be sure. Anyway, this seems a long way around a plant with only one leaf.

Brawn versus Brain.—Is there no significance in the fact that many of our colleges are better known through their foot-work than their head-work? Is it not significant that the Y. M. C. A.'s dotting our land are as strong in bowling-alleys as in education and that most of our religious training goes to the heathen? Is it a sign of health that so large a proportion of our newspapers are paid to feed us with results of useless experiments between prize-fighters? I think the stadium should be the accessory of the laboratory, not the temple of the oracle; and that in reality a research laboratory is more compatible with the object of a university than the more common training table. I do not mean to be too insistent as a critic or too pressing as an advocate, but I hate to see my own country such a trailer as it now is. I hope the conditions are changing, but I know they are not changing fast enough. All service is based on knowledge, and knowledge is an ever augmenting thing which almost anyone may increase. If the stock is *eternally* useful as it is, how great must be the value of the indestructible increments which anyone may produce. When so much of our material welfare, the condition and extent of our manufactures, the quality of our agricultural efforts, and the health of our people, depend upon the rate of our acquirement of new knowledge, there ought to be much greater effort made along the lines of research than is at present the case.—*From an article by Dr. Willis R. Whitney, in Science.*

Food of the June Bug.—When the return of mild weather makes open windows again possible, about the first thing to follow the omnipresent fly into the house is the May-

beetle or June-bug, a clumsy, big, brown, buzzing beetle that bumps about against the ceiling and ultimately falls into the lamp if this is possible. This interesting specimen is the parent of the white grub which one discovers so cunningly curled up in the soil when spading the kitchen garden. It takes the white grub two years to become a May-beetle, but it takes the May-beetle only thirty-one days to become a June-bug, an automatic advance, as it were, facilitated by the calendar. While the grub is growing up, it devours the roots and other underground parts of plants and is especially fond of potato and strawberry plants. In lawns and pastures, colonies of these grubs often ruin the soil over large areas. The adult beetles feed on the leaves of trees and show a decided preference for oak, poplar, apple, willow and hickory, though nearly all of the broad-leaved trees are attacked. An exception is made in the case of the box elder; even a June-bug has no use for that, though it does love that other tree-weed, the Carolina poplar. In Europe there are only two species of June-bugs, but when we go in for anything on this side, we spare no expense. The State of Illinois, alone, has thirty-four species. We have no record of the number in other States but have an idea that there are always enough to go around.

Leaf-Margin and Environment.—The beginning student of botany seldom regards toothed and notched leaf-margins as anything more than convenient means of identifying his specimens, but recent studies have shown the nature of the leaf-margin to be intimately related to the distribution of plants. A survey of the dicotyledon plants of the world shows an overwhelming number with entire leaf-margins in tropical and frigid regions, while those with notched and toothed margins, though represented in these regions, are much more abundant in temperate climes. Whenever a temperate flora contains woody species with entire leaves they are almost invariably extensions from tropical or cold regions. In the flora of the

North-eastern States, for example, the magnolia, catalpa, pawpaw, sour gum, red-bud, and others with this type of leaf, have pushed in from the South. The cause of entire leaf-margins seems to be found in temperature and moisture; regions that are either physically or physiologically dry and those in which great transpiration must occur produce the greater number of such forms.

ALKALOIDS OF BELLADONNA.—The belladonna plant (*Atropa belladonna*) though very poisonous is highly regarded as a drug plant, being almost indispensable in dilating the pupil of the eye when an examination of that organ is necessary, and equally useful in other ways. The supply of belladonna, like that of most of our drug plants, has hitherto been derived from wild specimens, but an investigation of such material has shown that the alkaloid, the part effective as a drug, varies greatly in different plants. The question then arises, can the plants be bred up to produce not only a more uniform alakloid content, but a higher percent of this substance as well. This question the investigators in the national government service have answered in the affirmative. Analysis of wild plants showed a difference in alkaloid content of nearly 300 percent, and by breeding from the plants with the highest percentage of alkaloid, this amount was still further increased. Subsequent cultivation has shown that plants with a high alkaloid content have no tendency to deteriorate in this respect. Since the physician must depend upon the pharmacist for the drugs he administers it is highly desirable that a given dose shall contain the full amount of the principle involved. The production of drugs of known strength, therefore, must be a long step in advance of present methods.

IRIS BRACTEATA.—The British Botanical Magazine for December, last, figures in color an interesting iris that does not seem to have come into cultivation on this side of the world, though it is an American plant. The plant is *Iris brac-*

teata. It was discovered in Oregon by Thomas Howell about thirty years ago. The flowers are clear, bright yellow with brownish purple or red veins on the sepals. Since yellow-flowered species are not common in the genus, the present species ought to be valuable as a starting point for other interesting forms.

SENSE OF SMELL IN INSECTS.—It would be impossible for anyone to say just how well the sense of smell serves the denizens of the insect world, but if the author of a paper recently presented before the American Society of Zoologists is correct, the perception of odors by the insects must be rather keen. Unlike the higher animals, the olfactory organs of the insects are located on various parts of the body, even on the legs and wings. It is reported that some butterflies and moths have from 500 to 1,300 olfactory pores, the moths usually having the larger numbers. Most of these pores are located on the wings. If they serve as so many individual noses, as they apparently do, the life of the insect must be largely dominated by odors. It would be absurd to assume that because we cannot detect odor in a flower that it is equally odorless to the bee or moth. It is quite within the range of possibility that many of the odors we are able to detect fail to register on the insect sense organs and *vice versa.* At any rate, an insect with 1,300 olfactory pores seems pretty well equipped for appreciating the odor of a flower if it has any.

NEW FORMS OF LILY.—The differences in color presented by the flowers of the meadow lily (*Lilium Canadense*) have long been a matter for speculation. In New England and other parts of the Atlantic Seaboard, the flowers are orange yellow; further west they are deep red. Up to the present, however, botanists have regarded one form as a mere color variation of the other, but Prof. O. A. Farwell considers the western form distinct enough to be regarded as a species and recently named it *Lilium Michiganense.* Since the color of the

flower is the chief distinguishing characteristic, it is likely that a good many botanists will incline to hold to the old name or, if it is regarded as distinct, to call it the variety *rubrum* as the nurserymen do. If the writer's memory is not at fault the red flowered form occasionally occurs in New England. If so, there is still greater reason for calling one a mere color form of the other. The observation of New England readers on this point would be of much interest. In addition to the new species described, two forms are distinguished; the variety *umbelliferum,* with several flowers from the top whorl of leaves, and the variety *unifolium,* which bears a single flower. Still another plant with smaller leaves is named *L. peramoenum.*

An Insect Fungus.—Some of the most remarkable fungi in the world are found in the genus *Cordyceps.* They have the peculiar habit of developing in the bodies of insects. When a spore once gains admission to the body of a caterpillar, it begins to grow and ultimately the fungus replaces the animal's tissues with its own cells until what was once an insect is now a plant with an exact likeness to an insect. At this stage the fungus is called a sclerotium. It may remain dormant for some time, but when the proper season arrives it sends up a club-shaped or branched sporophore which produces spores to repeat the process. The species of *Cordyceps* are widely distributed. They belong to a group of fungi known as Ascomycetes and are therefore not distant relatives of cup-fungi, grape and lilac mildew and many other plant pests. In some parts of the world the sclerotia of the *Cordyceps* is used as food.

Producing New Varieties.—We have repeatedly pointed out that the production of new varieties is a comparatively easy matter. In this matter anybody can be a Burbank in his own back yard. This fact is beginning to receive attention from the nurseymen and florists as may be seen from the following note taken from the editorial page of *Horticulture:* "In

his talk before the Horticultural Club of Boston, last week, W. A. Manda urged that the propogation of hardy garden herbaceous plants by seed should be more generally followed by growers in this country in preference to the more common method of root division. The result, Mr. Manda believed, would be in time a substantial increase in new forms and a general advancement in quality over the long cultivated types. Once a 'break' is started the progress of evolution would be startling. Many of our native plants, for example, still exist only in their primitive form although even in that stage they seem to suggest more promising possibilities than are apparent in the original wild chrysanthemum of China and Japan from which our highly cultivated varieties have been evolved. One need not think long nor deeply to conjure up wondrous things in imagination. There are plenty of subjects within the reach of any budding Lemoine well equipped with the required zeal, judgment, patience and—humility."

Magenta Flowers in the Garden.—An excess to which we are often impelled by this same innocent love of color, is the use of too many plants that have the strongest colors. One of the commonest complaints that ladies make is that "magenta flowers will not harmonize with anything in the house or outdoors, and we can't wear them." Gardening writers often express the utmost animosity against magenta, as if it were a bad color in itself. Is any color inherently bad, or is it largely a question of combination? Most of all the color discords in gardens are caused by the near-magenta colors, such as purple, crimson and crimson-pink. So notorious are these "troublesome colors" that careful gardeners have a rule not to buy a phlox, peony, iris, or chrysanthemum from a catalogue even when they are advertised as being delicate colors, like pink and lavender. Sad experience teaches that it is safer to select such varieties when they are in flower. If there is some plant of this color group which you love very much, can

you not harmonize it by surrounding it with a white flowered variety, since white is the peace-making color among flowers? If not, it is easy to refine any near-magenta flowers simply by putting them in deep shade. But would the world come to an end if these "dangerous colors" were omitted altogether? What if a certain garden contained no cock'scomb, Joseph's coat, spider flower, blue hydrangea, purple althea, Douglas spiraea, Eva Rathke weigela, Anthony Waterer spiraea, or kochia? Would it be forever ugly or are there enough other flowers in the world?—*From "The Prairie Spirit in Landscape Gardening."*

EDITORIAL

Whenever this magazine fails to appear on the first of certain months—as is invariably the case—our newer subscribers begin to grow anxious and some are wont rather peevishly to inquire why the magazine does not appear with clock-like regularity. As a matter of fact the issues are supposed to appear on the twentieth instead of the first, but while we name dates on which the magazine may be expected, "we give no assurances, expressed or understood," as the seed catalogues have it, that these expectations will be realized. The clock-like regularity of appearance is merely a pleasant little fiction which is included with the price of admission. Most of our readers are aware that the magazine is issued primarily for the editor's amusement and everybody knows what happens when business and pleasure meet on the same track. Only the millionaire dares side-track business for pleasure and play golf when he ought to be keeping tabs on the cashier. A considerable number of people like the magazine well enough to exchange a dollar for it annually and a lot of them have been doing this ever since the first number appeared. We certainly appreciate their support of the enterprise, but until enough others add their support to enable us to secure a real editor on a real salary, the magazine must continue to come out as the present overworked editor can find time for it. Our old subscribers understand the situation and make allowances accordingly. That the magazine will ultimately appear is one fact that all can bank on. The editor has issued nearly fifty volumes without ever doubling

up two numbers in one and thinks he has the hang of the business well enough to issue a few more after the same pattern. The only thing that gets on his nerves is for new subscribers to insist on having the January and March numbers of the magazine. He thinks they ought to know by this time that "there ain't no such animal."

* * *

The world has produced a number of individuals who have attempted to confer lasting benefits on posterity and made a muddle of it, but the one we nominate for the principal prize in such matters is the misguided individual mentioned in a recent number of *Torreya*, who goes about the country adulterating the flora with European material to the consequent confusion of all industrious plant geographers. *Torreya*, quoting from the *New York Times*, says of our hero that "ever since he was a boy he has delighted in transplanting the seeds of wildflowers and plants and trees, so that the growths indigenous to one section should find a home in another. He formerly took American seeds to European countries and planted them there, returning to this country with seeds from foreign lands which he planted in this country. In the Eagle Rock Park west of Montclair he has planted many foreign seeds, but most of his planting has been done in the woods of New York, New Jersey and New England. He usually goes on his walking trips carrying bags of seeds in his pockets. The seeds he tosses broadcast as he walks along. On his frequent railroad trips he carries seed from some foreign country in small packages wrapped in tissue paper. These packages, weighted with stones, he tosses from the train windows into the woods bordering the tracks." Hereafter when old Professor Dryasdust finds a new plant along the Atlantic seaboard, he will never be certain whether to write a long paper about the new discovery for the Botanical Society of America or to pull up and destroy the plant as a vile interloper. If we believed in reincarnation,

we would be inclined to report that the fellow that sowed tares with the wheat is again in the land.

* * *

A friend of the magazine has called our attention to the fact that the twelve-volume set of books describing the works of Luther Burbank which we mentioned in a recent issue have actually been issued for some time, are beautifully printed and illustrated, and apparently well edited. We are not disposed to misrepresent the efforts of anybody to improve our plants and hasten to make this correction, though still of the opinion that the results of Burbank's work have been greatly overestimated. We shall hunt up a set of those books as soon as possible and discover for ourselves whether the volumes are as accurate as regards the facts as a work of this kind ought to be, the pages we have seen having given us some doubts on the score. Our informant, however, is one of the country's most erudite botanists and what he says usually goes.

BOOKS AND WRITERS

Mr. W. H. Blanchard, 5 Guernsey Ave., Montpelier, Vt., is desirous of notes on blackberries from the Southern States. Mr. Blanchard holds the world's championship for blackberrying since in the pursuit of his hobby he has followed on foot the zone of ripening blackberries from Arkansas well into Canada and has described more new species from New England and adjacent territory than the manual makers supposed grew in all America. Several of his new species have been described in this magazine. Our readers living in the South should correspond with Mr. Blanchard. There may be a lot of new species in their own locality and if so Blanchard is the man to discover it.

The publishers of Underwood's "Our Native Ferns" inform us that the work will not be reissued since the last edition

sold very slowly. This announcement gives a side light on fern study that will be of interest to those planning books on ferns. As a matter of fact, the many popular books for the identification of ferns has afforded the public a short cut to the names, and the more formal text-books are no longer bought.

The "Botanical Textbooklet" mentioned in these pages some time ago, grew, by the time it was issued, into a pamphlet of nearly fifty pages with a single character key to twenty-eight families of plants and fifteen illustrations. The text gives the number of plants in the family, their distribution, their edible and other qualities and tells how to distinguish the different groups. . It is not a botanical manual but as an additional help to knowing the plants will be found useful. It costs 25 cents or it will be sent free for the asking to new subscribers and to all who renew for two years in advance.

The late Judge Addison Brown, one of the authors of the "Illustrated Flora of the Northeastern States and Canada," left a considerable sum of money for the purpose of illustrating our wildflowers in color. The series is to be called "Addisonia." There will be four numbers a year, each with ten colored plates, and the price of the volume will be $10. This country certainly needs a work of this general nature, but it is evident that the promoters of the present scheme have no idea of making it popular.

"How to Grow Roses" is the name of a little book issued by the Conard & Jones Company, West Grove, Pa., which has attained the dignity of twelve editions, the latest of which, revised and enlarged, has just been issued. Though published by a company of rose growers and evidently designed to advance their business through increased rose-growing, it is, nevertheless, about the best manual for the lover of roses that we have seen. The title exactly describes the first part of the book which, in addition to discussing how to grow the plants, does

not overlook what keeps them from growing, such as insect and fungous pests and the cold of winter. There is a descriptive list of 158 varieties of roses, lists of the best roses for different parts of the country, recipes for rose beads, descriptions of rose gardens, etc. The book has 120 pages and sells for $1. There are several colored plates and many other illustrations of desirable varieties of roses.

There is nothing especially new in the make-up of "Our Early Wildflowers," by Harriet L. Keeler, but the book, which is a small 16mo, is another of the "how to know" volumes destined to have a share in introducing the spring wildflowers to the novice. The species mentioned, about 130 in all, are arranged according to family and each has the usual description after which follows more or less information of an ecological nature. There are numerous good photographs of the plants described and many line drawings, the work of Mary Keffer. The author has made a curious misapprehension in one of the common names of the adder's tongue, spelling it faun lily. As a matter of fact its name is derived from the leaves, which are spotted like the coat of the young deer or fawn. The book is published by Charles Scribner's Sons, New York, at $1.25 net.

NOTICE.—This number was issued the first week in June and the next issue will appear some time in July. Though late, all the numbers will eventually appear.

Vol. 22. No. 2 Whole Number 109

THE AMERICAN BOTANIST

MAY, 1916

25 Cents a Copy; $1.00 a Year

WILLARD N. CLUTE & CO.
JOLIET, ILLINOIS

The American Botanist

A Quarterly Journal of Economic & Ecological Botany

WILLARD N. CLUTE, EDITOR

SUBSCRIPTIONS.—The subscription price of this magazine is $1.00 a year or $1.50 for two years, payable strictly in advance. Personal checks on small or distant banks must contain ten cents for collection fees. The magazine is issued on the 20th of February, May, August and November.

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WILLARD N. CLUTE & CO., PUBLISHERS

207 WHITLEY AVENUE, JOLIET, ILL.

ENTERED AS MAIL MATTER OF THE SECOND CLASS AT THE POST OFFICE, JOLIET, ILL.

Xenia in Maize.

THE AMERICAN BOTANIST

VOL. XXII JOLIET, ILL., MAY, 1916 No. 2

Amid the thousand blossoms of the lime
The gossip bees go hurrying to and fro,
And oh, the busy joy of working time,
And oh, the fragrance where the lime trees grow.

—Augusta Webster.

XENIA IN MAIZE

BY ADOLPH E. WALLER.

THE formation of the endosperm of a great many seeds from a triple fusion is a well known fact to all students of botany. When the contents of a pollen grain are discharged through the pollen tube, the first sperm fuses with the egg to form the embryo, while the second sperm unites with the two polar bodies, or polar nuclei, to form the definitive nucleus. This later becomes the endosperm tissue surrounding and protecting the embryo. It is here that a reserve supply of starchy material is stored. After the seed is planted and sprouting starts, the embryo draws on the endosperm for its food supply until the young plantlet can nourish itself.

The phenomenon called xenia is intimately connected with triple fusion. Xenia shows the immediate influence of the pollen in subsequent endosperm formation. If the second sperm from the pollen brings with it determiners for a dominant character that expresses itself in the endosperm, i. e. if pollen from blue flint corn is transferred to the silks of white dent corn, then

the effect of the pollen is apparent the same year the cross is made.

The accompanying photograph shows an ear of corn with about one fourth of the kernels blue, marked off on one part of the ear. It was obtained by carefully dividing the silks and bagging the shoot. Two days later pollen from blue flint was placed on one part of the silks, the other being carefully protected with oiled paper. After forty-eight hours more the bag was removed and the shoot was allowed to be open pollinated with the pollen from the white dent of the field in which it grew. A blue kernel appears everywhere a silk received pollen from blue flint. Two blue kernels appear out of line showing the division not entirely accurate. There are also five white kernels in the blue area. But in the illustration a difference in the intensity of blue pigmentation causes some of the blues to look as light colored as the pure white, while in the original specimen the contrast between blue and white is more definitely marked. The misplaced white kernels are marked on the photograph. By exercising sufficient patience and ingenuity many rings or bands and stripes of color could be obtained, or particolored ears to suit the manipulator's fancy.

For the purpose of demonstrating the immediate effect of the pollen in this "manufactured" ear, blue and white were the contrasting characters chosen. Other characters that affect the color or texture of the endosperm could as well have been used. For instance pollen from field corn transferred to sweet corn or from corn with yellow endosperm to corn with white endosperm would have served the same purpose.

With three varieties, white sweet, yellow dent, blue flint, at his disposal, it would be possible for anyone to make an ear containing kernels of three colors and two endosperm compositions and of any design his imagination may suggest. Using the white sweet (both of these are recessive characters) for the

carpellate parent and supplying pollen from all three varieties, blue, white, yellow, starchy, and sweet kernels could be formed. That triple fusion and xenia bear the relation to one another of cause and effect, but that not all triple fusions are followed by xenia could also be demonstrated by pollinating blue flint with pollen from white sweet.

THE LICORICE PLANT

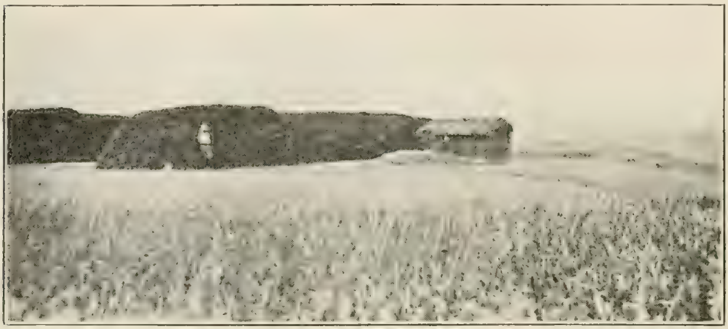
By H. E. Zimmerman.

MANY people who are now grown up remember that not so many years ago licorice root was a favorite commodity among the boys and girls of the public school. Because of its sweet and agreeable taste it was a common sight to see pupils with a piece of this root in their mouths, chewing one end of it. In those days country stores sold a good deal of licorice in this form to persons who enjoyed chewing it. Black licorice, in stick form, gradually supplanted the root form.

Botanically the licorice plant belongs to the legume or bean family of plants. It has long, pliant, creeping roots, and reaches a height of about three feet, and bears a small purple flower, which fills the air for miles with a sweet, heavy smell. It derives its name from two Greek words which mean "sweet root." The juice is used in medicine as an emollient and demulcent, and also for disguising the taste of nauseous drugs. It is also used to flavor snuff and tobacco. The plant grows in the East, especially in the territory of the Tigris and Euphrates Rivers. The first year's growth resembles a loosely twisted string of tow and may run to 20 feet in length. The second year it assumes a woody substance when dry, and the third year it becomes valuable. The time for digging the root

is in the winter, when it is dried and crushed under heavy stones drawn round on it by mules, much like olives are crushed to extract their oil.

The plant grows wild, and some of the natives regard it as a pest. In the eyes of the Bedouins who transport the product by caravan to seaport, the root in itself is of no value except as it may be used to kindle fires. The industry is a great blessing to a comparatively poor region, requiring hun-



Piles of Licorice Root.

dreds of natives to harvest and prepare it for shipment. The crooked and imperfect sticks are used for firewood, while the straighter and more perfect sticks are tied in bundles, to be shipped to America, the principle market for it.

The large pile of roots shown in the illustration was found near Antioch, Syria. It represents thousands of tons. Such gigantic piles of licorice root are to be seen all over Syria. The American Tobacco Company, the largest buyer of this root, owns the pile here shown.

VEGETATION OF THE HAWAIIAN SUMMIT BOGS

By Vaughan MacCaughey.

THE general geography of the Hawaiian Islands is well-known to the educated reader. The mid-Pacific location of this remote archipelago, its shining coral strands, the magnificent cloud-crowned mountains, the rivers of black lava, and fiery lakes of incandescent rockstuff,—these features have received wide publicity. The islands have been visited repeatedly by men of science and by exploring expeditions, and the distinctive characters of Hawaii's natural history are generally appreciated.

Undoubtedly the least-visited and least-known regions in Hawaii are the remarkable summit bogs. Altho of great geologic and biologic interest, their almost inaccessible situations, and the hardships incident to visiting them, have effectually deterred all but the hardiest of mountaineers. They are reached only by scaling dizzy ridges and dripping cliffs, perpetually swept by fog and rain, and often hidden for weeks together by their thick cloud-mantles. These high bogs are of particular interest to the naturalist, not only because of their unique topography, but because of the rare plants that occur in no other places. It has been the good fortune of the author to have made pedestrian journeys over all the larger islands of the Hawaiian group, and it is the purpose of the present paper to describe somewhat in detail these high swamplands, with their unique vegetation.

The general appearance of the Hawaiian bogs is similar to that of the bogs familiar to continental botanists. The soggy soil is covered with a thick vegetable mold of decaying turf and mosses, the soil proper being composed of disintegrated basaltic lava, varying in color from dark brown to pale gray. It is exceedingly fine-grained, like "adobe", and is very tenacious of its large water content. Under the stunted clumps of bushes and dwarf-trees, there is a considerable accumulation of dead branches and twigs in the mold; frequently this material is in an excellent state of preservation.

The surface of the bogs is covered with tusock-forming grasses, sedges, sphagamus, and other mosses. Abundant species are *Panicum isachnoides, P. imbricatum, P. monticola, Oreobolus furcatus, Carex sandwicensis, Deschampia australis, Luzula hawaiiensis,* and others. There is practically no standing water or pools, although the vegetation is water-soaked, and the rainfall excessive. The bogs are neither treeless, nor is there a continuous arborescent cover. Here and there are clumps of gnarled dwarf-trees, and these clumps occasionally coalesce into larger units.

Some of the distinctive smaller plants, in addition to the turf-plants already enumerated, are: the insectivorous *Drosera longifolia;* the elfin *Metrosideros pumila;* a number of endemic woody violets, *Viola;* a terrestrial orchid, *Habenaria holochila;* several *Lycopodiums;* several *Astelias;* several varieties of *Plantago pachyphylla; Wilkesia Grayana; Geranium humile; Lagenophora mauiensis; Acaena exigua;* and several woody *Lobelias.* The dwarf trees comprise a variety of genera and species; almost all of them are endemic, and the majority are highly precinctive. The *Vacciniums* are not abundant in the bogs; in Hawaii their zone of optimum growth is at a lower level than the bogs, and under conditions of lesser humidity. There are none of the pitcher plants, ericaceous forms, *Calopogons,* or *pogonias* of the continental bogs in the Hawaiian bogs.

There are six bog regions of importance, each situated on or near the summits of lofty volcanic mountains. Named in order, from west to east, they are: Wai-ale-alè, on Kauai; Ka-ala, on Oahu; Halawa Swamps on Molokai; Puu Kukui, E-eke, and Wai-a-napa-napa. on Maui; and the Kohal Swamps, on Kohala. There are also swampy areas on the slopes of Mauna Loa, Mauna Kea, and Hualalai, on Hawaii, but these lack the distinctive vegetation of the summit areas listed. These summit bogs all lie within the cloud zone, at elevations of from four thousand to seven thousand feet.

The Ala-kai Swamp, on the upper slopes of Mount Wai-alè-alé, Kauai, is unquestionably the largest, wettest, and most dangerous bog in the archipelago. Its elevation is 3500 to 5000 feet, and its occupies an area of some sixteen square miles. The treacherous morasses are fog-swathed almost continuously throughout the year. The total annual precipitation is enormous, indeed well-nigh incredible, and probably exceeds eight hundred inches (sixty-five feet). There are authentic U. S. Hydrographic Survey rain-gauge records of over 120 inches in a single month. The atmosphere, vegetation, and spongy soil are continuously saturated.

The quaking morass is covered with thin turf of alpine character, mosses, and stunted ligneous vegetation. In many places there is no solid ground, the quagmire trembles at every step, the hazardous trail is very indistinct, and a misstep plunges the chilled and water-soaked adventurer waist deep into the gray mud. Large areas of the bog are absolutely impassable. The prevailing temperatures are low, and a night spent near the summit is a chilling and thoroly uncomfortable experience.

The testimony of Professor William A. Bryan, who made extensive ornithological expeditions into this region, may be taken as representative of the hardships encountered

by everyone who has attempted this dangerous country. He states (Natural History of Hawaii, p. 107), "The writer, with an experienced native guide, spent three weeks in the region . . . and amid chilling rains and bewildering fogs made an expedition extending through four days over miles of quaking moss-grown bog to . . . the summit of Wai-aleale. We were never out of the dense fog during the expedition, and that we returned to our camp and the civilization at all has always seemed little short of the miraculous . . . Our chief concern was to locate reasonably solid ground, a necessary precaution that entailed many weary miles of wandering in the wierd moss-grown wilderness."

This vast bog is an inexhaustable reservoir for all the leeward streams, and has given them the material for cutting the great canyons of southern Kauai. A considerable portion of the island eight to ten miles south of the bogs is thus abundantly supplied with water at all times. In a similar manner the bogs of Molokai and of Kohala are the headwaters of important streams.

The plant life, although stunted and windswept, is diversified. A high percentage of the species and varieties are endemic. A number of the varieties are bog forms of species that are abundant at the lower levels. The lehua (*Metrosideros polymorpha* Gaud), which in the forests of Puna is a magnificent tree towering to the height of 125 feet, on the summit of Wai-aleale is a stunted shrub, or even a prostrate creeper among the sedges. The native name for a portion of this swamp is *Lehua makanoe,* which means "the lehua tree in the fog."

In his monumental treatise on "The Unwritten Literature of Hawaii" (Bureau of American Ethnology, Bulletin 38), Dr. N. B. Emerson gives a translation of an ancient *mele* which contains so much of interest, that it is presented in part:

"Wai-aleale stands haughty and cold,
Her lehua bloom, fog-soaked, droops pensive;
The thorn-fringe set about swampy Ai-po is
A feather that flaunts in spite of the pinching frost.
Her herbage is pelted, stung by the rain;

Bruised all her petals, and moaning in cold
Mokihana's sun, his wat'ry beams."

Commenting, he says, the "summit, a cold, fog-swept wilderness of swamp and lake, beset with dwarfish growths of lehua, is used as the symbol of a woman, impulsively kind, yet in turn passionate and disdainful. The physical attributes of the mountain are ascribed to her, its spells of frosty coldness, its gloom and distance, its fickleness of weather, the repellent hirsuteness of the stunted vegetation that fringes the central swamp . . ." The *mele* is indicative of the intimate knowledge of these summit bogs possessed by the ancient Hawaiians, and to this day the only reliable guides are the few remaining old-time Hawaiians.

Oahu has only one very small bog, located on the summit of Ka-ala, in the Waianae Mountains, elevation 4030 feet. This range is very old and has suffered great erosion and degredation. Unlike Kauai, there are practically no uplands. The summit ridges are exceedingly narrow, the comb of the ridge averaging less than six or eight feet in width. From the lowlands the summit of Ka-ala appears tabular, but this is an optical illusion. The bog is only a few square rods in area, and is abruptly bounded by extensive precipices. The soil is a deep, spongy peat mold, interlaced with tree roots and decaying branches. The trees are stunted, wind-swept, and very old. The lapa-lapa tree (*Cheirodendron platyphyllum* (Hook. & Arn) Seem.), is a distinctive species of this swamp. All of the woody vegetation is covered with saturated clumps of epiphytic mosses, liverworts, lichens, and ferns. The general impression is that of senility. There are many indications that this is the "last stand" of what was at some former time a much more extensive bog. The heavy precipitation that

maintains the swamp is at the same time slicing away its margins. In a comparatively short geological period the summit bog of Ka-ala will vanish entirely, as has that of the degraded Ko'o-lau Range along windward Oahu.

Molokai is a long, narrow island, forty by ten miles in extent, with the long axis due east and west. Like Oahu and Maui it is a volcanic doublet, the two cones having appeared at widely separated periods of volcanic activity. The western cone is dry and barren, rising only to a height of 1382 feet, and is largely covered with introduced ranch grasses. There is no forest and no swamp land.

The larger eastern dome presents a striking series of contrasts with its western associates. It rises to a height of nearly 5000 feet. The long windward face is marked by stupendous precipices and deep valleys. The scenery is of heroic proportions. The summit has been eaten away by the great ampitheaters of erosion, like Ka-ala, so that in the heart of the mountains occur precipices literally thousands of feet in height. The crown is covered by dense jungle forest. The high flatlands at the head of Halawa Valley are cloud-capped and boggy. These Halawa bogs correspond topographically and biologically to the summit bogs on Wai-aleale and on West Maui. They cover an area of several square miles. The bogs are bounded on all sides by enormous precipices; the eastern cliffs are marked by the beautiful waterfalls of Moa-ula and Hi-pua-pua.

The Molokai bogs exhibit many features common to those of Kauai and Maui. The lava soil is hidden under deep layers of water-saturated mosses and decaying vegetation. The arborescent growth is sparse and stunted, and bears all of the ecological earmarks of its cold, foggy, humid habitat. There is a large number of precinctive species and varieties. Like Wai-aleale, many parts of the bog are practically inaccessible. The introduced goats and deer that have ravaged

the lower forest levels are unable to live in this water-soaked highland, so that the flora exists in its primitive condition.

There are two summit bog regions on the island of Maui. West Maui, which is deeply eroded, is crowned by *Puu Kukui* (5788 feet). On a narrow summit ridge, a mile and a half to the north of this peak, is an ancient tufa crater basin, *Eeke*. The saucer-shaped interior of this crater, and much of the narrow summit flats between it and Puu Kukui, is boggy. The vegetation is strikingly similar to that of Wai-aleale. Puu Kukui rises directly above the great amphitheater of Iao Valley. Eeke hangs on the verge of a similar valley bowl, Wai-hee. The torrential rains that have so enlarged the valley heads, maintain the elevated bogs. Although difficult of access, these bogs have been frequently visited by scientists, and their floral and faunal contents are better known than those of Molokai or Kohala.

Of comparatively recent exploration are the boggy flats that lie at the extreme head of Kipa-hule Valley, on the eastern slope of East Maui. A small lake, Wai-a-napa-napa, occurs in the midst of these high swamps, at an elevation of eight thousand feet. The general aspect of the Wai-a-napa-napa swamps is similar to that of Molokai. The entire windward slope of the Hale-a-ka-la calderon is characterized by torrential precipitation. A large part of the upper jungle forest is inaccessible unless the party is equipped with machetes and axes. The complete exploration of this deeply eroded and densely vegetated area lies in the future.

The only summit bogs on Hawaii occur in the Kohala Mountains, at the northern extremity of the island. This range is of great geologic antiquity, and undoubtedly existed long before the formation of the vast volcanic domes that lie to the south and now dominate the island. The island of Kohala probably existed as such,—and much larger than the present Kohala Range,—simultaneously with the island of

West Maui. As with all Hawaiian mountains, the rainfall is very heavy on the windward, northeastern, slope, averaging 300-400 inches. The leeward side is semi-arid below the 1500 foot contour. The swamp lands lie along the rounded summit, —5489 feet,—and occupy an area of several square miles.

Numerous disintegrated cinder cones and volcanic blowholes give evidence of the prehistoric activity of this cloud-swept morass. Some of the vents are eight to ten feet in diameter and several hundred feet deep. As the mouths are invariably masked by luxuriant vegetation, they are veritable pitfalls, and require constant vigilance on the part of the explorer. The dense forest growth and thick layers of mosses and ferns now effectually hide the great majority of these volcanic vestiges. Prolonged erosion has carved enormous valleys,—Wai-pio, Wai-manu, Ala-kahi,—back into the very heart of the mountain. Beautiful waterfalls drop a sheer fifteen hundred feet down the vertical walls of these gigantic amphitheaters. Just as on the other islands, the swampy flatlands that crown the valley walls are densely covered with stunted hydrophytic vegetation. The dwarfed trees are clad with epiphytes,—mosses, liverworts, and ferns predominating. The beautiful indigenous lobelias of the genus *Clermontia* constitute a characteristic feature of the Kohala swamps, and are represented by a number of species.

SOAP FROM WILD PLANTS

By Charles Francis Saunders.

NATURE evidently intended man to be cleanly, for long before the invention of soap she had stocked the earth with plants capable of being used as soaps and quite as effective as the manufactured article. In the United States alone there are half a dozen genera of native plants which contain saponin in sufficient quantities to make them capital detergents. They are most numerous in the arid Southwest and on the Pacific Coast, and are variously known as soap-weed, soap-root, soap-plant and *amole*—the last being the name given by Spanish-Americans. Botanically these plants are indigenous species of *Cucurbita, Ceanothus, Chenopodium, Chlorogalum, Yucca* and *Zygadenus,* in addition to which an Old World species of *Saponaria* is represented in the herb Bouncing Bet, which, originally cultivated here as a garden flower, has now become a naturalized escape in many parts of our countryside.

Of these soap plants it is usually the root which is used, and all that is necessary to do is to dig this up, rinse it, crush it somewhat, and rub it briskly between the hands in water, when a lather is produced which quickly cleanses the skin leaving it agreeably soft. In the case of several species of *Ceanothus,* which are particularly abundant in California, the flowers and the green seed-vessels may be used with like effect. These shrubs are known as wild lilacs and during their season of bloom covers entire hillsides in places with a delicate veil of color. There is one species of *Ceanothus* (*C. Americanus*) indigenous to our Atlantic seaboard and known commonly as

New Jersey tea. It possesses the same saponaceous property. Perhaps the most interesting of our soap-weeds is *Chlorogalum pomeridianum*, a bulbous lily-like plant of the Pacific Coast, which presents its soapy offering in a particularly neat manner. The bulb is the part used, and this on being dug up is found wrapped in a loose jacket of coarse fibre, which may be readily

Ceanothus or wild lilac.

stripped off, taking all stains of earth with it and leaving a clean, moist ball of "soap" for instant use.

The saponaceous character of most, if not all, of these plants was thoroughly understood by the Indians, and certain tribes in the Southwest employ them to this day in their ablutions, particularly in the purification preparatory to religious rites—the use of commercial soap in this connection being considered inadmissible.

REGENERATION IN ELODEA

By N. M. Grier.

DURING the past year, the writer, while observing the growing of *Elodea* (*Philotria*) *canadensis*. Mchx. in a laboratory aquarium, was led to note the apparent regularity with which buds and adventitious roots made their appearance upon the plant. Of 61 cases examined, it was observed of the roots that in no case these appeared less than 7 nodes apart, nor more than 13, 11 being most common, and the average number being 10. It was thus apparent that root-forming material was localized.

This led to speculation as to what portion of the plant would be able to act as a unit organism if judged by the capacity to produce roots and buds when detached from the parent organism. Accordingly, a series of experiments were made in the procedure to be described. By means of sharp, sterile scissors the plant body above the anchoring roots and junction of the branches was divided into 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 segments respectively, and grouped as such, care being taken to cut above and below the leaves of each terminal whorl when possible to prevent the probability of any damage to these. Five cuttings of each were taken, and each placed in a stender dish of appropriate size in water obtained from the same source as that in which the parent plants were growing. The experiments extended about a month, and the results obtained in that time are best presented in the following table:

Group	Number Surviving Operation	Number of Buds Formed in Group
I	0	0
II	1	1
III	1	1
IV	2	2
V	4	2
VI	4	3
VII	5	3
VIII	5	4
IX	4	4
X	4	4

Upon examining the above table, it will be observed that the number of buds formed in each group tends to substantiate the fact that at every ten segments, (as was found to be the *average*), the bud elements are located. Thus group I taken as a whole containing 5 segments could not be expected to produce any buds, group II in all 10 segments, could be expected to produce 1, group VI consisting of 30 segments would most probably produce 3, etc. The discrepency in group 10 may be explained by the fact that immediately after sectioning, the 5th member of that group commenced to disintegrate, as was also the case of the non-surviving member in group IX.

It will also be noted, that the greater the number of segments represented, the greater the chance of survival of that particular piece, but that survival does not always imply that vegetative buds will be formed, as to be seen in the cases of groups 5, 6, 7, 8. Some pieces of these groups are as green today as at the time of sectioning, but show no vegetative tendencies. It seems probable to the writer that under ordinary conditions pieces consisting of 10 nodes represent the minimum size of plant at which the activities of the parent organism are duplicated, and this statement seems warranted by the fact that in those pieces of less than 10 segments, an advanced state of development of the buds usually resulted in the death of the parent section, due probably to the withdrawal of nourishment.

The development of buds was always immediately succeeded by the formation of roots adjacent to them and later, opposite.

In some cases 3 or even 4 roots were formed, but never more than one bud in these experiments. There appeared to be some degree of polarity in that the buds were formed slightly superior in position. The first roots, while at first positively heliotropic, and at first produced at right angles to the stem, shortly afterwards curved in under the stem and away from the light.

The fact that at the base of each new bud roots appeared might indicate that the localization described would be of use to the plant, especially since under ideal conditions, the stem tends to become brittle, and that there is a tendency for the stem to die away beneath the branches, although it should be remembered that the habitat of this particular form—in slow streams and ponds—is such as would preclude the probability of any constant strain making these properties useful.

A NEW SPECIES OF ALLIUM

By J. M. Bates.

IN June 22, 1906, about four miles southwest of Grand Island, Nebraska, I collected a lavender-pink form of *Allium* which at the time did not greatly interest me. I had found *Allium Canadense* rather common in the vicinity with the usual bulblets and considered this simply a sport of the black-seeded type. In 1907 I found it at Wood river, 16 miles west, and named it *A. Canadense.* In June, 1910, I found it in perfect condition with lavender flowers in the railroad yards at Hastings where it was evidently introduced. My attention was now fully engaged. I carried the bulbs to Red Cloud and planted them in two gardens for study and for the enjoyment of its beauty. Later I found it at Havelock, ten miles east of Lincoln, and at Walton and Weeping Water, east of Lincoln, and on July 2 my son collected it for me eight miles west of Lincoln. With this distribution it is certainly noteworthy that our botanies make not mention of so beautiful a thing. I have sent it to Dr. N. L. Britton to be grown in the New York Botanical Gardens.

Allium Lavendulare N. Sp.

Larger plants two feet high. Bulbs, covered with network, the largest 7/8 of an inch in diameter. Leaves flat, 2 4/12 wide, more than half as long as the scrapes. Heads from 1½ inches to 2½ inches across, densely flowered. Bracts 3, broad, abruptly long acuminate. Perianth segments lavender, 4/12 long, acute. Capsule not crested, obovate, flat-

tened. In sandy to very rich heavy soils. Closely related to *Allium mutabile,* Michx. It does not grow with that plant but occupied the ground by itself. Some would call it merely a variety of *mutabile.* It is simply a point of view which is constantly changing. I publish it in this way to call attention to a plant worthy of cultivation. The delicate lavender fades into pink with age and upon drying in press.

PLANTS AND ANIMALS FUNDAMENTALLY ALIKE

FUNDAMENTALLY, plants and animals are very much alike. I mean the resemblances are much more basic than the differences. The latter, very conspicuous to the eye, may be regarded as differences of degree, rather than of kind. Of many of the lower forms of life, it is still very difficult to say whether they are plants or animals; of the whole group of bacteria for example. For the primitive doubtful forms of life you will recall that Haeckel created the special kingdom of Protista. To my mind a fundamental unity runs through all living things from the lowest to the highest like a gold thread through a tapestry. For one thing, all are *alive;* all possessed of that unstable equilibrium of forces expressed by the words *growth* and *decay.* These phenomena are the properties of a substance called protoplasm. In both plants and animals this substance is organized into the form of cells. In both, usually, it is the outer protoplasmic membrane that controls the passage of *ions,* the disassociated electrically charged elements of water and other compounds. The same wonderful process of cell multiplication by *mitosis* occurs in both plants and animals. In both, except in the lowest forms, these cells are organized into *tissues* with *division of labor.* In both, there is a *sexual method of reproduction.* Plants, indeed,

propagate also non-sexually by *budding*, but so do many of the lower animals. In many plants there is *regeneration* when parts are cut away, but so there is in a great variety of animals. Even their foods are not different. It is true, the plants differs decidedly from the animal in possessing an apparatus for elaborating inorganic substances into starch, sugar, and proteids, which the animal consumes, but it makes these substances for its own use, not for the animal. It is sometimes assumed that the inorganic substances, of earth, air and water, are the food of the plants, but such is not the case. The plant depends for its growth on the same nutrient substances as the herbivorous animals, viz., on starch, sugar, and proteid, which it has stored in every seed and under every growing bud. The phenomena of birth, growth and decay are essentially the same in plants and in animals; but corresponding to higher development, the animal has many special organs either wanting altogether in the plant, or greatly simplified; it also has flexible cell walls while the plant has rigid cell walls. But both plants and animals *respire*, both *assimilate* food substances and *oxidize* them with resultant work; both require about the same amount of water and mineral salts; both have a *circulation* of fluids and both *secrete* and *excrete* a variety of substances, acid, alkaline, and neutral. The response to stimuli, such a gravity, heat, light, radium, X-ray, electricity, and poisons, is much the same in both groups. In irritable response, plants and animals both obey Weber's Law; that is, to increase a response in an arithmetical ratio, the stimulus must be applied in a geometrical ratio. There is a suggestion, even, of a nervous system in plants since stimuli are passed along certain channels to distant organs, and the movement can be slowed down by cold, increased by heat, or inhibited by poisons applied midway, the response, according to Bose, being not simply hydro-mechanical. Even the idea of locomotion does not distinguish animals from plants. Many of the

lower animals are rooted fast, while many of the lower plants have swimming organs and are actively motile. Moreover, all of the higher plants, change position more or less; all are sensitive; all show rythmic movements. Finally, the intimate cell-chemistry of the two groups (production of digestive enzymes, and the amino-acids, etc.), so far as known, is much alike.—*From an article by Dr. Erwin F. Smith in Science.*

Applied versus Pure Science.—The antithesis between applied science and pure science is sometimes emphasized to the point of bitterness. The only salvation in the situation is that society as a whole overcomes some of the narrowness of its individual members. The chemical researcher is supplemented by the practical man who dyes cloth and tans leather and makes sugar. Society is gradually evolving special agencies to help her in overcoming the narrowness of specialists. She is evolving specialists whose business it is to bring to narrow-minded practical workers the results of the researches of narrow-minded students of science. These middlemen are sometimes unable to get the sympathy of either group whose efforts they are trying to unify.—*Judd: Psychology of High School Subjects.*

NOTE *and* COMMENT

A Private Public Park.—Curtis G. Lloyd, of Cincinnati, Ohio, a sort of Elbert Hubbard among students of fungi, with a leaning toward puffballs and shelf fungi, has recently purchased a picturesque tract of land near his home town and turned it over to the public for a picnic and recreation ground. Unlike the average millionaire who gives a park to his city, Mr. Lloyd seems to have no desire to make the public contribute in some measure to his benefactions, and not only proposes to look after the upkeep of the park himself, but has provided for a continuance of this service after he has removed to more flowery fields. In the same manner he and his brother, John Uri Lloyd, have provided for the perpetuation of the Lloyd Library and Fungus Museum which occupies two three-story buildings in Cincinnati. The people of Cincinnati are fortunate in being able to number such men among their citizens. The kind is far from common. Some day, other men with money to spare will awake to the fact that there are other ways of benefiting the public besides contributing to colleges, churches, and hospitals, worthy though these latter may be.

Age of Concord Grape.—Some things seem to have existed from the beginning of time, simply because we have always been accustomed to seeing them. One of these is the Concord grape. This grape is probably more largely grown in America than any other variety, though its predominance is of comparatively recent date. The oldest Concord grape vine in existence is much younger than many persons now living. It

is, in fact, less than seventy years old. The Catawba grape is nearly fifty years older but it never attained to the Concord's popularity. The grape, however, is not an isolated case. When we begin to inquire into the history of almost any of our varieties of fruit, we find that all are of comparatively recent origin. The varieties in cultivation a hundred years ago were seldom up to the standards we hold at present. Probably the fruits of another generation will in their turn excel those which we regard so highly.

VARIETIES OF GARDEN FLOWERS.—The conservative botanist is not the only one to complain of the undue multiplication of varieties. The gardener, like his scientific confrere, is beginning to find the flood of new forms somewhat embarrassing and objects to many of them as trivial variations of no value to anybody. In the *Modern Gladiolus Grower,* one nurseryman voices his complaint in part as follows: "Take any catalogue that describes a long list of varieties and one of experience cannot select the best by the descriptions, for all are described in such a way that they appear to be good and we might say extra good. If one of experience cannot select the best, how is the average amateur going to select them? I formerly had the mistaken idea that the more varieties the catalogue contained the better, but now I believe the fewer the better, provided they are the best obtainable. If I ever issue another catalogue I shall have fewer varieties, but those the best of their color. The past summer I compared my irises when in bloom with this end in view. I now have twenty varieties of German Irises in my catalogue that are blue of different shades and markings and my next catalogue will contain but four or five. What is true of the iris is true of most flowers, but probably peonies are the most abused of all flowers in this respect. I have over 150 varieties of peonies and if three-quarters of them had never been named they would not have

been missed. If this is true of 150 varieties then how is it with the party who advertises 1,200 varieties and then has the audacity to say 'all good ones' "

Yellow Fruits.—One is warranted in expecting yellow-fruited forms of all fruits that are normally red, just as he is justified in expecting white-flowered forms from those with ordinarily blue or red blossoms. The occurrence is a sort of recession on the part of the plants and appears to be due to a lack of the determiner that causes the deeper color to develop. Mr. D. J. Talcott writes of finding yellow fruit of the red-berried elder (*Sambucus racemosus*), *Viburnum opulus,* and *Actaea rubra* and notes that the golden queen raspberry is a sport from the cuthbert red. To this list the writer can add yellow fruited holly (*Ilex opaca*) and winterberry (*Ilex verticillata*) and yellow tomatoes are common. It would be interesting to make a complete list of the fruits of this kind and we shall be glad to note any other instances that may be called to our attention. Black fiuits may sometimes have red-fruited forms, but it is usual for fruits of this color to produce white forms. White blackberries, white or pink blueberries, and other white fruits are well known.

Variation in the Rate of Evolution.—A great deal of botany at present becomes a subject for elucidation by the philosopher. It no longer is thought to be mere chance that determines whether a given plant family shall number trees among its species, or consist only of herbs. It has been pointed out by E. W. Sinnott in an address before the Botanical Society of America, that the rate of evolution must be very different in trees and herbs. Herbs with the very brief period from seed to seed are able to accumulate changes much more quickly than can the slower growing trees and shrubs. New species, and even new genera, therefore, arise more quickly among the herbs, and yet, while these plants often have numerous species in the genus the woody plants are said to out-

number them the world over. In order for the slowly changing trees and shrubs to produce so many species, a long period of time must have been necessary, and this suggests that the tree groups are much older than those containing only herbs. The fact that trees change more slowly than herbs is reflected in the catalogue of every nurseryman, for there are always a larger number of varieties catalogued for herbs than for woody plants.

Cause of Leaf Movement.—A large number of plants are able to make changes in the position of their leaves as circumstances warrant. In many cases these changes seem directed by something akin to intelligence, though explained in other ways. One of the commonest instances of this is found in the sunflowers, whose leaves, and often the flowers, turn toward the sun all day. In the so-called "sleep" of plants the leaves or leaflets usually fold together though the plants do not sleep in the accepted sense of that term. Still another set of movements seem connected with evaporation. On a hot, dry day, the leaves of corn roll up, the compass plant sets its great leaves on edge and the leaves of many other plants, especially those of the Leguminosae, assume positions that ensure a reduced evaporating surface. An investigation of such phenomena has shown that such changes are entirely automatic and are produced by the very condition which the leaves seek to avoid. When one side of a thin board begins to dry out, the fibers contract and in consequence it warps or curves toward the dry side. In a similar way leaves may lose enough water from the upper surface to cause the whole leaf to roll up. In cases where the leaf changes position without rolling, some special part of the petiole usually reacts to evaporation. Changes of this kind may be produced artificially by the application of some drying agent, like alcohol, to the surface of the leaf.

Double White Trillium.—Mr. D. J. Talcott, Madison, Ohio, sends us a remarkable double flower of the large white trillium (*Trillium gradiflorum*) which consists entirely of petals—twenty-one in all. Not only have all the other floral parts been turned into petals but the flower has acquired two extra whorls of three parts each. The whole flower is quite rose-like and would make a desirable addition to the garden. The rhizome which produced this specimen bore two other flowers of the same kind and was found in a colony of the regular type. Mr. Talcott writes that he has experimented with trillium rhizomes and finds that they will grow from divisions as readily as irises do.

Colors in Wild Lilies.—The article in the February number of the *American Botanist* concerning the meadow lily (*Lilium Canadense*) is of much interest to me, as in my field study I have found the same variations in color and form in the wood lily (*Lilium Philadelphicum*). This is also called by Gray, wild orange-red lily from its color. The variety *andinum*, which he locates farther west, is quite abundant in swampy woods or thickets near the other on the island of Marthas Vineyard, Mass. This latter variety usually grows taller, has one or three or sometimes as many as four blossoms of a beautiful deep red shade at the top of the stem.—M. [If the wood lily varies from red to yellow, this would seem to be an added indication that the meadow lily's change of color is not a specific character. More observations on this color of *Lilium Canadense* are needed.—Ed.]

Nature Versus the Gardener.—I wish more things were like the English sparrow. How it thrives although every man's hand is against it. But we must spray fruit, and use serum on meat animals and doctor the soil which produces the cereals. It always pleases me to visit a patch of wild plums; they get along without bothering anyone. What a fight man is compelled to make for the apple, and what a free gift the

wild plum is! I lately rode through the country in an automobile and the road was lined with wild crab-apple trees. They were in full bloom and very beautiful but no one had sprayed them or trimmed them: they were a free gift of nature. Are the English sparrows, the wild plums and the wild crab-apples so healthy because they have never been reformed? —*Ed Howe in The Independent.*

WHEN TO GATHER CATTAILS.—The rich brown floral spikes of the stately cattail flag, common everywhere in marshy lands, are a great temptation to bring indoors for home decoration in the autumn, but the fluffing of the heads destroys their beauty, as well as makes trouble for the housewife. This fluffing is due to the cattail being gathered when too mature. If the stalks are cut early in summer, immediately upon the spikes turning brown, it will generally be found that they retain their beauty indoors throughout the winter.—S.

SNOW AS A PLANT PROTECTION.—Reports from various sources indicate that not for many years have the spring wild-flowers been so abundant or so beautiful as this season. Trailing arbutus has rarely been so perfect in foliage and purity of color. Violets, bloodroot, hepatica, spring beauty and other gems of the woodland seem to have found the peculiar characteristics in the weather of the recent winter and spring greatly to their liking, and in our gardens the same healthy vigor and profuseness of bloom is in evidence among all the low-growing spring flowering border plants. The reason for it all is easily discerned in the deep snow which this year covered so large a section of the country and protected these things against the ferocity of the February and March weather. In many of the spring flowering garden shrubs, it is interesting and instructive to note the well-defined line of the snow blanket, flowers being produced in profusion on the lower branches of forsythia and azaleas of the Daurica type, while above the line every flower is blasted. At this

season of the year, one of the most momentous questions for the gardener is that of the effect of the winter on many of the most prized garden favorites. One can never be sure, until buds are well along, as to what he may expect from his rhododendrons, cornuses, wistarias, early clematises and many other things which because of their precocity are so easily started into activity by a few warm days in early winter, and their flowerbuds, divested of their protecting overcoats, doomed to be ruined later on. The problem of winter and spring effect is full of puzzling contradictions and one year's deductions are quite likely to be overthrown by the experiences of the next year. But one thing is sure—deep snow, long tarrying, is the garden's best winter friend.—*Horticulture.*

Reproduction in Trees.—I read in the February, 1916, number of the *American Botanist* some astonishing statements under the above caption, viz., " the oak begins to bear when it is between sixty and seventy years old, the ash between forty and fifty." The statements are taken from W. B. Beach in *Tree Talk.* I do not know where the writer is so unfortunate as to have his residence where he can expect to see so little of the "fruit of his labors" in tree planting, but I assure him we do not have to wait any such length of time in fertile Nebraska. There is an English oak (*Quercus pedunculata*) on the campus of the University of Nebraska that bore acorns ten years ago when the tree could not have been over 25 years old. The University was founded in 1869; so that ten years ago it was 35 years old. The tree is very thrifty and has no marks of age except its acorns. The mossy overcup oak (*Q. macrocarpa*) is common over most of Nebraska and bears when it is eight or ten feet high, possibly fifteen to twenty years old. *Quercus acuminata* bears at about the same age, and *Q. prinoides* when three feet high. The white ash of eastern Nebraska and the prairie ash (*Fraxinus campestris*) of all Nebraska make six to ten inches of growth a year and

bear when not over ten feet high. Since writing the above, I find a prairie ash not over ten or twelve years old bearing fruit in Hastings in front of the Rectory walk.—*Rev. J. M. Bates, Red Cloud, Nebr.* [We had our suspicions about some of the statements made in the article criticised but, felt sure that if they were open to question our readers would discover them. We are agreeably surprised and pleased to find how carefully this magazine is read by scientists and scholars whose time is valuable. The best part of this matter is that we copied the article in question not from the original source but from a magazine that copied it and the readers of neither magazine took exception to the statements. All of which proves—but why make the other magazines jealous?—Ed.]

Useful Pigweeds.—Apropos of the interesting note in the February number of the *American Botanist* concerning quinoa and other species of *Chenopodium,* I might mention the use by the Pacific Coast Indians of at least two species of the same homely genus. One of these, *C. Californicum* has a root with pronounced saponaceous qualities and on being crushed in water it forms a lather. This was used as a soap and the plant is known as soap-plant by Americans familiar with this characteristic. The seeds of this species, as well as those of *C. Fremonti* (abundant in Oregon), were also used for pinole, being toasted and ground into flour to which water was then added to make an edible mush. Probably under cultivation these plants could be made a valuable source of human food, just as quinoa has been.—*C. F. Saunders.* [In the current number of the *National Geographical Magazine,* O. F. Cook writes that two species of *Chenopodium* are regularly planted for food by the Peruvians and that these are the only seed crops grown in the elevated districts that are too cold for corn. One of these, the real quinoa, grows to a height of three or four feet and is chiefly valued for making beer. Only the white seeded variety is considered edible, the

other varieties being very bitter so that they have to be boiled with several changes of water to make them palatable. The white quinoa, according to this writer, makes an excellent breakfast food fairly comparable with oatmeal both as to taste and texture. The second pigweed is called canihua and is used exclusively for food. The seeds are much smaller than those of quinoa and of a grayish color. They are slightly parched and then ground into a fine flour. The chief use of canihua is as a travel ration for the shepherds.—Ed.]

Duration of Life in Rudbeckia.—If you leave it to the books, the black-eyed Susan (*Rudbeckia hirta*) is a biennial; that is, it devotes the first summer of its existence to accumulating sufficient food materials for the formation of flowers and seeds and, after these have been produced, the second summer it dies. But the plants themselves, do not view the matter in this light. They are really perennials. In the editor's garden there are plants of this species that have been there five or six years and show no signs of giving up the struggle. The fact is, that if the *Rudbeckias* are left unprotected during the winter, some of them may fail to resume growth in the spring, but this may happen to any plant if the winter is one of alternating cold and warmth with the consequent heaving of the ground by frost. The plants are not killed by mere cold, however. On the other hand it is not unusual to find in a bed of seedlings many plants that are ready to flower two months from the time they appeared above ground. Possibly all the plants would flower the first year if given an equal start in spring. It is possible, however, that there is both an annual and perennial strain in this species similar to that well known in its relatives the gaillardias, which might be developed by breeding.

Decorative Galiums.—By many lovers of flowers, the species of *Galium* are regarded as insignificant weeds and the opinion can not be challenged if the goose-grass or cleavers

(*Galium aparine*) is selected as the type, but there are a few whose beauty or usefulness lifts them out of this category. The northern bedstraw (*Galium boreale*) is beautiful and decorative enough to be admitted to the flower garden, and indeed is occasionally cultivated, though it manages very well for itself along roadsides and on moist banks where its tiny, though numerous, white flowers form conspicuous patches. A nearly related species (*Galium mollugo*), evidently named for its resemblance to the Indian chickweed (*Mollugo verticillata*), is frequently cultivated. The flowers though exceedingly small are borne in such myriads that its common name of Scotch mist seems fairly descriptive. Beginning about midsummer it blooms for a month or more and is highly valued for adding to bouquets of sweet peas and other flowers whose beauty of form is one of their distinguishing characteristics. It is often called baby's breath, but this name is regarded as belonging by rights to one of the pinkworts—*Gypsophila paniculata*. Our plant is a native of Europe but has escaped from cultivation in various places in the North Atlantic States. The common name of cleavers, applied to members of the *Galium* genus, is equivalent to the term "stickers" applied to other plants whose seeds or stems cling to the clothing of animals or even of man himself.

Food of the Robin.—Just across the street from where this is written, a robin is rearing a family in a lofty elm and feeding it with insects from our garden. Everybody knows in a general way that robins eat earthworms and the larvae of various insects, but it is not until some such opportunity as this brings the matter to one's attention that he realizes how great the number and variety of insects captured, or that the bird has preferences in the matter of diet. As soon as the writer goes into the garden, the mother bird appears and demands food by numerous insistent chirps. She seems to regard digging in the garden as one of Nature's schemes

for providing bird food and is so intent on securing this that some care has to be exercised to avoid stepping on her. Early in the season, earthworms were apparently quite acceptible food, but with the advent of young ones, a decided fondness for cutworms, wireworms, white grubs and May-beetles was apparent and the earthworms were neglected. Of the entire list of insects, the white grubs were first in favor. Nothing else could induce the robin to feed from the hand, but the sight of the squirming, fat, white grubs always overcame her caution. The number of harmful insects that a single robin will pick up in an hour is astonishing. Apparently the only representatives of animal life left in our garden are the earthworms. The only point for concern in this, is that there may possibly be nothing left to attract our bird another year, but if this should happen we will import some.

Twisted Stems.—A subscriber on the Pacific Coast writes: "The other day when walking on the Marin County hills near San Francisco a young engineer told me that the ridges in the bark of coniferous trees follow a spiral about the tree always toward the right. He pointed to a Douglas fir to confirm his statement and I could see a very slight tendency for the lines to vary somewhat from the perpendicular toward the right. I had never noticed it and fear I am somewhat skeptical as to its being an invariable custom. Is this known to be a fact, and if so, why? In the high sierras I have seen dead junipers that looked as though they had been twisted all the way around, but thought that this might have been due to the constant winds." At the tip of a growing stem, there is a group of cells which by frequent division add to its length. The new cells formed are at first much smaller than mature cells and increase in size by lengthening and stretching. The lengthening process appears not to occur simultaneously throughout the stem but follows a spiral path, which in most plants might be described as winding upward to the right. Why growth should proceed in this man-

ner is unexplained. Possibly it is a survival from early ancestors in which a single apical cell carries growth upward, as in ferns, where first one cell and then another is cut off from a single apical cell in a never-ending spiral. The leaves of plants, are also arranged on the stem in spirals and twining stems wrap themselves about their supports in a similar way. If a twining stem that has risen above the earth and is feeling about for a support be watched, it will be found to travel round and round in ever-widening circles, and this is also caused by the peculiarities of cell growth already referred to. It is possible, therefore, that the twist in the bark and wood of trees is produced in the same way. In trunks of trees that have been stripped of their bark, such as those used for telegraph and telephone poles, the twist in the wood is sometimes very noticeable.

A Despiser of Gardens.—Probably there is no subject in the whole world that everybody would agree on; even the gentle art of gardening has its critics. One of the world's foremost literary men, noted for his culture and refinement, wrote as follows in reference to gardening. "A garden is an ugly thing. Even when best managed it is an assembly of unfortunate beings, pampered and bloated above their natural size; stewed and heated into diseased growth; corrupted by evil communication into speckled and inharmonious colors; torn from the soil which they loved, and of which they were the spirit and glory, to glare away their term of tormented life among the mixed and incongruous essences of each other, in earth that they know not and in air that is poison to them." Pretty strong, isn't it? And the writer was John Ruskin!

EDITORIAL

A good many years ago, as we reckon time at this office, a botanical society existed in the United States which was unique in consisting of members who had never seen one another, and it was not promoted by institutions for the blind either. The members were possessed of all the faculties vouchsafed ordinary mortals with possibly a few others as distinguishing marks, but residing in widely separated localities, they found it desirable to conduct the affairs of the society by correspondence. The society was divided into geographical sections and each member reported quarterly to his division secretary. The reports, properly arranged, were then circulated from member to member. A better scheme for promoting botanical study could scarcely be imagined. The spirit of co-operation and helpfulness that pervaded the membership made the association of great value to all who had a place in it. Each felt himself charged with the duty of discovering at least one new thing in botany by the time the quarterly reports were due and was stimulated thereby to a deeper interest in the subject. The lasting effects of such an interest has since become apparent, for looking over the old lists of members, beginners and amateurs in those days, one finds more than one name that is now written high on the roll of science. Although a corresponding society with widely scattered members, various opportunities made personal acquaintance possible and the editor counts among his valued experiences several lasting friendships made in this way. We do not know whether the society is in existence or not, but it ought to be. Some of the old members, who continue to read this maga-

zine, will doubtless be able to enlighten us on this point. In some respects the readers of this magazine remind us of this old society. We seldom ask for information on an obscure point without getting a reply, and as for mistakes, we have never yet been able to print a misstatement of fact and get away with it. Even a mis-spelled word will often bring a shower of letters if the correction seems important. We call attention to these things here for the benefit of certain new readers who might otherwise be some time in finding out that one of the best features of this magazine is formed by the short notes which anybody can contribute and which are often suggested by the notes of others. There are altogether too many botanists who think no fact is important unless several pages of type are necessary to elucidate it.

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The world has long been inclined to poke fun at its conception of the botanist who is usually represented as an amiable elderly gentleman equipped with manual, trowel, vasculum, and lens, wandering about the fields, ogling the flowers through a glass, and so intent on his hobby as to be oblivious to all else. The devotees of modern botany, too, absorbed in the study of cells, chromosomes, and unit characters, and forgetting the foundation upon which even their studies are based, are wont to look with some disdain on the mere collector and namer of plants. Time was, however, when he who knew the names of plants was the only person thought worthy to bear the title of botanist, and though the days are forever gone in which the taxonomist was chief, there is still much to be said in favor of the analysis of flowers and the making of an herbarium; of the times when botany was spoken of as "the amiable science" and attracted to its study all intelligent lovers of nature. In these more degenerate days, most of the botanists are made within the walls of college or university. Often they develop without ever seeing plants in their entirety and are brought up on sec-

tions and microscopic mounts. Their attempts at naming the species with which they work often amuse the taxonomist who, though dubbed a mere collector, did not arrive at his knowledge of plants without a strenuous apprenticeship in solving the intricacies of his phase of the science, during which his perceptions were sharpened, his judgment quickened, and his powers of deduction strengthened. The individual who knows intimately the flora of his region is entitled to both the respect and admiration of the community. He should be an object of envy were it not in every man's province to do likewise. Botany as a vocation, compared with other phases of science, is an underpaid and profitless pursuit, but botany as an avocation, especially plant collecting and plant naming, is still the amiable science. What other study can so completely take one away from the cares of ordinary life? Every excursion afield is a vacation trip into unknown regions. With one or more like-minded companions, equipped with lunch and collecting case, the botanizer enters a new world from his very doorstep; poking about the hedgerows, exploring strange woodlands and unfamiliar ravines, making voyages of discovery along pond and stream, and everywhere, from meadow to mountain top, making new acquaintances, accumulating unexpected treasures and steadily adding to those impressions which it will always be a joy to recall. And then, when his dwelling is reached at the end of a day's tramp, comfortably tired he sits down with books and specimens and lives over again the day's adventures, verifying his suspicion that some unfamiliar plant is a rarity to be prized, discovering that he has extended the known range of a species, or possibly finding among his specimens new forms or varieties. Small wonder that in the days when all botany was like this, amiable was the only proper term with which to characterize it.

BOOKS AND WRITERS

A new bi-monthly journal, devoted to recording data bearing on heredity, has begun publication at Princeton, N. J. It bears the title of *Genetics* and costs $1.00 a number. Judging from the first issue the contents are likely to prove too technical for any but the advanced student though doubtless exceedingly valuable for reference in all that pertains to its field.

After one has seen a student of the mosses peering through a compound microscope at some all-but-invisible peristome or leaf-cell, he is likely to get the idea that the study of mosses cannot be successfully carried on without the aid of the optician, but such is not exactly the case. In genera containing numerous species that closely resemble one another, a resort to the microscope may be imperative, but it is quite possible to recognize many species without even a simple lens. The reviewer, many years ago, took to collecting mosses, but lacking the patience and the books to properly name them, was kindly helped out of the difficulty by a friend in Concord, New Hampshire. After a specimen was once named, however, he found very little difficulty in recognizing it again when encountered. The mosses have so many peculiarities of growth, habitat, color, and structure as to fairly warrant the claim of "How to Know the Mosses", by Elizabeth Marie Dunham, that it will enable the beginner to name his plants without a lens. The book consists of descriptions of about 80 genera and 150 species of the common mosses in the North-eastern States with illustrations of most of the species described. Two complete keys, based on the leaves and capsules respectively, are given, and several explanatory chapters make clear the few technical matters mentioned in the book. Naming the mosses by the use of this book should be both fascinating and easy. As in other studies, the first few species will be the hardest to name, but

by selecting the more characteristic forms, and therefore the most easily identified, first, these will act as guides along the way and make the rest easy. The book contains nearly 300 pages and is published by Houghton Mifflin & Co., Boston at $1.25 net.

"House Plants; Their Care and Culture" by Hugh Findlay is, as its name indicates, a guide to the care of the plants in the house, which begins with several chapters on soils, potting, watering, and the like, and then discusses the needs of the different plants usually grown in houses. As regards the directions given, it may be said that they are practical and to the point, though not always as scientifically accurate as one would expect from a professor in Syracuse University. For instance we suspect that a good many physiological botanists, would scarcely subscribe to the statement on page 45 that "The leaves are the lungs of the plant and if these are clogged by dust the plant catches cold, sickens and dies." In the section devoted to the care of individual species, some account is first given of the group to which the plant belongs and a list of the more valuable varieties for house cultivation are usually given. We note the use of the words Natural Order for what botanists universally call the family, and various scientific names are also mis-spelled, but these faults do not detract from the correctness of the cultural directions given. The book contains more than 300 pages and 125 illustrations. It is published by D. Appleton & Co., New York and costs $1.50 net.

We have received a circular describing six books on fungi which the author asks us to notice in this column. His circular states, however, that he makes no reduction to anybody, dealers included and supplies no copies for examination, from which we infer that any exchange of courtesies we may be inclined to make will be quite like the handle of a jug—all on one side. A dealer who invests his money in advertising and postage designed to make an author's books more widely known cer-

tainly deserved some recompense and even magazines cost money to issue. Few dealers are disposed to push a given book for mere love of the writer, but there are a lot of embryo scientists coming along that take this very peculiar view of the matter. Until we are converted, however, we are going to let our author advertise his own books.

In 1897, the late Prof. E. S. Goff, of the University of Wisconsin, issued a little book on "The Principles of Plant Culture" of which seven editions have appeared. Now comes the eighth, revised by Professors J. G. Moore and L. R. Jones of the same university. The title may sound as if the book were designed for the teaching of agriculture, but it has a wider field. It is, indeed, a clear account of the fundamentals upon which all plant growing rests. The agriculturist seldom goes beyond knowing how; the present book will tell him why. Though the related information is arranged in definite chapters, each paragraph is usually a complete account of the phase of the subject treated, so that the book may be read backward or forward or may be begun in the middle. The practical botanist can scarcely open the book anywhere without finding something of interest, and he can feel sure that it is authoritative and up-to-date. All individuals with enough interest in plant life to become good botanists ought to have the book. If he cannot find what he wants in it, we do not know who can tell him. The Macmillan Company, New York, are the publishers. The price is $2.25.

The success of Stevens' "Plant Anatomy" has necessitated a third edition, and this, revised and enlarged, has just appeared from the press of P. Blakiston's Son & Co., Philadelphia. The general excellence of the work is well known, but it may not be amiss to note again that it is arranged on a constructive plan beginning with cells and tracing their modifications through the various tissues of the plant. The activities of the cells, as expressed in such functions as absorption, trans-

piration, photosynthesis, secretion, excretion, storage, and reproduction, all have chapters devoted to them, after which come chapters on the use of the microscope, reagents and processes, the microchemistry of plant products and the adulterations in foods and drugs. The book is now an octavo of 400 pages with more than 150 illustrations. The price is $2.50 net.

A loose-leaf "Manual of Soil Physics" containing forty-four exercises by P. B. Baker and H. J. Young, of the University of Nebraska, has been issued by Ginn & Co. Following the directions for performing each experiment, there are several questions regarding the results obtained. The authors state that the manual has sufficient material in it for two semesters work, but to the reviewer it would seem as if a class might cover the ground in much less time. The experiments are those usually given in high school classes. Teachers of Agriculture should find them of considerable value. The price of the notebook in the "Biflex" binder is 65 cents.

Vol. 22. No. 3 Whole Number 110

THE AMERICAN BOTANIST

AUGUST, 1916

25 Cents a Copy; $1.00 a Year

WILLARD N. CLUTE & CO.

JOLIET, ILLINOIS

The American Botanist

A Quarterly Journal of Economic & Ecological Botany

WILLARD N. CLUTE, EDITOR

SUBSCRIPTIONS.—The subscription price of this magazine is $1.00 a year or $1.50 for two years, payable strictly in advance. Personal checks on small or distant banks must contain ten cents for collection fees. The magazine is issued on the 20th of February, May, August and November.

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In 1913, at the completion of its twentieth volume, **The Fern Bulletin** was consolidated with this magazine. The back volumes average more than 100 pages each, and since they cover the entire formative period of American Fern study they are invaluable for reference. The majority of new forms discovered in recent years have been described in its pages. First six volumes out of print. A set of vols. 7 to 20 will be sent for $7.00. An extended description of the contents of the volumes may be had for the asking.

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207 WHITLEY AVENUE, JOLIET, ILL.

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BLACKBERRY LILY.—*Pardanthus Chinensis.*

THE AMERICAN BOTANIST

VOL. XXII JOLIET, ILL., AUGUST, 1916 No. 3

Now from the thyme upon the height,
And from the elder blossoms white,
And pale dog roses in the hedge,
And from the mint plant on the ledge,
In puffs of balm the night air blows
The perfume which the day forgoes.
And on the pure horizon far,
See, pulsing with the first-born star
The liquid sky above the hill.
The evening comes, the field is still.

—Matthew Arnold.

THE BLACKBERRY LILY

By Willard N. Clute.

IF one desires to see the blackberry lily (*Pardanthus Chinensis*) at its best, it is likely that he will have to visit some old-fashioned garden where new styles in flowers are slow to penetrate. Here in some sunny corner, in company with bleeding hearts, asphodels, foxgloves and other plants dear to our grandmother's hearts, he may find its yellow-green sword-shaped leaves and branching trusses of curiously mottled flowers adding their note to the prevalent air of quaintness. Judged by standards of beauty alone, the blackberry lily must yield to many a denizen of the modern garden, and no longer finds favor in the eyes of cultivators, but undisturbed by this change in public opinion, it has slipped through the

fence and struck out for itself like the toad-flax, musk-mallow; tawny day lily, tall cinquefoil and other outcasts from the garden, and may be found here and there colonizing a bit of roadside for itself with a fine show of independence.

In both flower and fruit this plant is so unique that a good many flower lovers still find a place for it in their collections. I know of no other flowers so curiously mottled and barred. The generic name, *Pardanthus,* under which I have chosen to list it, is especially appropriate since it signifies leopord flower. Modern taxonomists, however, insist that the correct name is *Belamcanda*—a term by which it appears to be known in its home land.

Though called a lily, it bears this title by courtesy only. It is really one of the Iridaceae, as its three stamens and inferior ovary indicate. The flowers, however, have more the appearance of lilies than irises, for they spread out in the six pointed stars with which we are familiar in many of the Liliaceae. The three outer segments of the perianth—really the calyx—are distinguished by their slightly paler shade. The ground color of both calyx and corolla is a sort of tawny yellow and this is overlaid with bars, dots, and splashes of dull purplish red. The flowers last but a single day, opening rather late in the morning and closing about sunset, the perianth rolling up on the top of the ovary in a tight little twist. New flowers continue to open, however, and the blooming season lasts for many weeks.

Shortly after flowering, the seed pods become noticeable. At first they are triangular green objects like ordinary iris ovaries, but as the season progresses the outer husk splits down into pale gray papery valves exposing the shining black seeds attached to a stout axis, the whole very closely resembling a ripe blackberry. The seeds are covered with a thin pulp—really an aril like those of bittersweet and pomegranate—and the whole structure almost entitles us to call it a berry.

It really is as much of a berry, as the blackberry and raspberry, for botanically, even these are not berries.

In growth, the blackberry lily is so much like an iris that for all purposes of cultivation it may be treated as if it were an iris. It multiplies vegetatively by means of a branching rootstock, but the seeds germinate readily and young plants reach blooming size about the second year. When once established, it seems to require little care, but it is all the better for a mulch of leaves or straw during the winter, especially in the more northern parts of the country. Though never so conspicuous as its relatives, the gladiolus and iris, it nevertheless deserves sanctuary in the garden and will repay such kindness by thriving in any odd corner.

AN IDEAL SERIES FOR THALLOPHYTE-BRYOPHYTE STUDY

By R. I. Raymond.

T IS the writer's conviction, after some eleven years of teaching Freshmen classes in Botany and Biology, that the commonly suggested type-series of Thallophytes and Bryophytes, as found in most text-books and laboratory manuals, is not as desirable an introduction to these plant phyla as may easily be produced, and this too whether the series be looked at as an introduction to phylogenetic conceptions, or as picturing physiologic-morphologic advances, or as simply typifying the great groups in certain select representatives.

One cannot escape the conviction, moreover, that the usual types are chosen, in almost stereotyped fashion as texts come and go, for the very poor reason that they are easily procurable —as if that might be taken as a good reason for inclusion or exclusion of this or that organism. But the days of "Clado-

phora" as an algal specimen, and "Marchantia" as an all-sufficient exemplification of a liverwort are gone, we trust forever; and the large variety of genera and species offered by the biological supply houses today renders a defense of the haphazard choice of illustrative types both futile and needless.

To be specific: we desire to have specimens that will (1) adequately represent the groups, without undue specialization, —"central types"; (2) offer a progressive sequence in physiology and morphology without sacrifice of natural relationships; and (3) picture the main lines and data of phylogenetic history, and do this without implying precarious genealogical hypotheses.

Now it is just this list of desiderata that the "orthodox" types, as we might almost dub them, fail to satisfy. To begin with, we wish an exceedingly primitive, isolate, holophytic cell with which to commence the Thallophytes (I include here the Protophytes), and what do we find proposed? *Pleurococcus,*— or worse, *Oscillatoria*. The first is already triply specialized beyond the imperatively simple structure of a primordial type; for it possesses a nucleus, chromoplasts, and a cellulose wall; and the second is an even more fraudulent substitute for the thallophytic "precurseur", it is even filamentous!

Again, take the Chlorophyceae: why pick the bizarre *Sphaerella* as a type in place of the ideally unspecialized *Chlamydomonas?* And why on earth suggest even *Pandorina* or *Volvox?* Can we get "to anywhere" in botany by following the morula-blastula road so clearly indicated in these organisms? And why present the Zygophycean cul-de-sac to the bewilderment of the neophyte? Such groups lead to nothing and profit the student not one idea, except a trifle of curious data in algology. What is the use, moreover, of introducing the unusual and never-to-be-met-with-again problem of coenocytism in *Vaucheria*—*unless* it is at once followed up by the treatment of the

Phycomycete problem? And among the Phaeophyceae, it is almost perverse to select *Fucus,* when *Ectocarpus* and *Laminaria* might be chosen and would present in simplest and vivid form the double problem of phaeophycean derivation and evolution toward the thalloid type.

When we get to the Bryophytes things are somewhat better, but the Fungi leave us with the uncomfortable feeling of having witnessed a waxwork show. It really is not incumbent upon a botanical text writer to fish up every devious bit of morphology and reproduction in his mycological treasure-house; he might do vastly better to simplify his material and order it in some fashion other than mere taxonomy suggests. And are we all so afraid of our smugly cherished "authority" that we cannot suggest to the student where likelihood of relationship lies? Can we not at least follow the results of latest authoritative research, and give the tyro the comfort of that? No line of fungi dropped down from heaven or instituted itself by any *geratio aequivoca.* Every one of these groups has an origin in holophytic ancestry, and where the connection is even partially evident, it should be put before the student, however tentatively one feels it need be done. The German texts are away ahead of us in this respect; there is no timidity in their handling of morphologic problems or of phylogeny. But of the fungi and their typic exemplification more anon.

In the Bryophytes there still lingers the *Marchantia* tradition that will continue to claim an absurdly disproportionate amount of space in comparison with the importance of the curious group. But, (I cannot avoid the feeling of debt here to Campbell's archegoniate studies), the truly representative genera, such as *Pellia, Ricciocarpus, Anthoceros,* are being given their due. One gets the impression that the mosses are still "lumped", for there is little attempt made to get them into relation with the liverworts or to indicate their own progress;

but after all that is a minor matter, for the mosses are unimportant little beings, however interesting for their own *beaux yeux,* and the treatment of the unimportant is not of such great consequence.

But the whole matter is different with the other groups mentioned. They do lay foundations—*all* the foundations of later plant history—and we have no right to pick at random the specimens that go into the picturing of those profoundly significant evolvings of primordial plant life.

I have sketched out in the following what I have grown to consider an ideal series, from the standpoint of the considerations referred to above. Naturally, substitutions in it may be suggested, but in most cases, any substitution would lose some one or more of the desirable points presented in the "ideal" type enumerated.

For the institution of plant study I select one of the nitrifying organisms, a non-chlorophyllous, non-flagellated organism, without nucleus, and with homogeneous (non-alveolar) protoplasm—the simplest holophyte conceivable. In such a form there is no stumbling-block for the student in the way of already present specializations. At the same time, it furnishes an ideally simple morphology in which the whole series of assimilation-reactions is accomplished: the synthesis of carbohydrates, of amino-acids, of proteins; and together with these the universally present respiratory, growth, and reproductive functions. To have these fundaments worked out in such an elementary exemplar simplifies their comprehension tremendously—that much as concession to good pedagogy; and incidentally, this choice of example is vouched for by the best of authorities, Nature herself, inasmuch as without question such organisms were the earliest types.

From the nitrifying bacteria (non-flagellated) the way to an understanding of the Chroöcoccaceae and Oscillatoriaceae

is easy; for the alveolation of the cell-protoplasm with consequent increase in cell-volume, the primitive chromoplasts, and the primitive nucleus are simple steps to make; and the varieties of colonial (filament) organization offer no difficulties of interpretation.

Again, one of the *flagellated* nitrifying bacteria (*Nitromonas*) serves best as an introduction to the flagellate type of cell; for in the first place, there is hardly question but that flagellation historically preceded the other specializations of the Chlorophyceae, and, in the second place, such a simple type presents only the one new characteristic upon which we wish to concentrate attention. All the problems connected with locomotion may be treated here elementarily, yet satisfactorily.

Chlamydomonas is a next selection as exemplifying the origin of the great Chlorophycean group. Here the discussion of the alveolation of protoplasm, the specialization of the henceforth indispensable auxiliary, chlorophyll, and the significance of the nucleus and its phenomena, may all be taken up. Indeed, it seems to me most urgently advisable (and class-room experience justifies the conclusion) to thrash out each problem *in the earliest type in which it appears,* rather than wait till we reach the complex types. *Chlamydomonas,* moreover, serves as an ideal introduction to the sex-problem in plants, and the evolution of the pure isogamy found here will warrant considerable space of lecture-energy.

For a type in which the advent of the walled, non-motile stage is indicated—yet in simpler form than the fillament-organization—*Tetraspora,* will serve. The significance of the cellulose restraint upon all later plant life is to be stressed here.

Ulothrix is always an admirable introduction to the filaments—and to the fourfold zygote division that apparently instituted the later sporocarp and sporophyte. *Stigeoclonium,* in other respects like *Ulothrix,* exemplifies the origin of the

branching filament. *Aphanochaete* (I admit a not very common genus) presents an ideal alga for the exemplification of gamete-differentiation, together with the tendency toward concrescence of branches that eventually leads to the thalloid types. The decided advantage of this genus in the presentation of gamete-differentiation lies in the fact of its obvious and immediate relationship with the preceding types and the succeeding. Citations of *Cutleria* or *Pandorina* and *Volvox* are quite beside the mark when such a satisfactory genus as *Aphanochaete* is available for the demonstration. *Coleochaete soluta* serves as an excellent type for presenting the final differentiation of the sex-cells and for the significant increase in size of the fertilization-product, the sporocarp. *C. scutata* pictures the transition of body-form from a concrescent filamentous structure to a leaf-like thallus.

Right in this connection the problem of fungal origins is to be best taken up—as far as the Phycomycetes are concerned; and it is well, pedagogically speaking, to utilize such vivid transitional cases for the stimulus they offer to the student in the direction of homologies and data of phylogenetic significance. Bessey's consistent and courageous treatment of the alga-like fungi in close (in fact immediate) relation with their progenitors should have a more hearty assent, it seems to me, than we have given it. And there is little difficulty in introducing the types through an ideal series. First the problem of coenocytism is to be worked out in the algal ancestry; and for this *Cladophora* and *Vaucheria* serve excellently. In the latter, the second problem, that of saprophytism, is raised and its solution indicated in the occurrence of the "rhizoids". *Saprolegnia* next, with its incipient degeneration of the sexual process, introduces the fungal types proper (the student might well be referred here to the Phyllosiphonaceae). *Albugo* and *Rhizopus*, illustrate the further adaptation to aerial life and the ultimate degeneration of gamete-differentiation.

In passing on to consider the brown algae it may be suggested that the laboratory study of but two types is sufficient for such an isolated group. As mentioned above, *Ectocarpus* and *Cutleria* are preferable to *Fucus,* inasmuch as in the first, we have simple filamentous body-structure passing into thalloid, and in the second thalloid, purely with very instructive differentiation of gametes; while the third type involves at once the complex thallus structure along with fully differentiated reproductive organs.

The red algae may conveniently be treated by examination of the usual laboratory types, *Nemalion* and *Polysiphonia.* Perhaps one need not be too chary of finding homologies with the Coleochaetaceae, and of instancing the parasitic species in preparation for later study of the Ascomycetes. It may be well to remind authors here that the institution of the sporophyte generation is something that took place in time; that the reduction divisions in the chromosomes that separate gametophyte from sporophyte generations are simply an immediate occurence in *Coleochaete* (and lower algae), a later incident of life-history in the Rhodophyceae; and that therefore the "chasm" between Chlorophyceae and Rhodophyceae is merely one of arbitrary assumption.

The Ascomycetes are best treated in immediate connection with the red algae, for obvious reasons, and the homologies deserve much more than the casual mention they usually receive. An aquatic type should certainly be utilized to begin with, and the lichenous form *Collema* is advisable as easily available. The closest of homologies between this species and Rhodophycean types may be traced, as regards the whole reproductive process and organ-complex. The gradual ecologic shifts in habitat (aquatic to terrestrial) and nutritive method (symbiotic to parasitic) may be indicated for the group by following up *Collema Sphaerotheca* and with *Pyronema.* Only after con-

sideration of such two types should the complex apothecium-producing forms be taken up.

In investigating the Basidiomycetes the beginner is best aided by starting with *Ustilago*—*not* the Hymenomcytes, as having too highly developed a sporophore, and *not* the Uredinales, since their study involves the puzzling succession of spores. After *Ustilago, Exobasidium* and *Clavaria* may be taken to illustrate the establishment of true basidium-structure and the origin of the fleshy sporophore. *Hydnum* and *Agaricus*, finally, indicate the appearance of the pileus form of spore-bearing and the development of the characteristic gill-hymenium. The Gasteromycetes might well be left out of an elementry course.

As we enter the Bryophyta, we need indications of the derivation of amphibious from aquatic habitat. For this *Ricciocarpus* serves well, but we should be careful to make much of the land-thallus *physiology*—a subject almost neglected save in the matter of reproduction. *Notothylas* should be intercalated between the type just mentioned and *Anthoceros*, because of its intermediate complexity in sporotype structure; the leap from the spherical to the large columnar body being a real difficulty to the student. The *Marchantia* and *Jungermannia* forms may be passed over with little consideration, as with the Gasteromycetes.

For the mosses it should be said that the series cannot be easily presented unless *Sphagnum* (*not* a "common moss") be taken first—this of course on account of its gametophyte structure as well as that of the sporophyte. A single true moss suffices for the Bryales,—it should *not* be the peculiarly complex *Polytrichum*.

In the above choice of specimens for first-year work in the field indicated there will be found an avoidance of the specialized types that are so bristling with difficulties for

the novice, and on the other hand there will be found a series of forms, full of suggestiveness to the young comparative morphologist, and one serving at once to vitalize comparative physiology and give broad ground for evolutionary thought and taxonomic enthusiasm.

BOTANIZING IN THE CORPUS CHRISTI REGION

By R. A. Sell.

ORPUS CHRISTI BAY, being shut off from the Gulf of Mexico by a chain of narrow sand spits with only a few passes connecting, is one of the most attractive resorts in the world. Shallow salt water, tempered ocean breezes and the absence of an undertow combined with fishing grounds where an amateur can fish with some degree of success, are features that have been advertised quite extensively, but the plant life which is both varied and distinctive has received comparatively little attention.

As the bay is, in reality, a remnant of a larger body of water much of the adjacent land is composed of sand, shells and other beach deposits. Throughout a very large territory a sheet of salt water can be found about on a level with the surface of the bay. Fresh water cannot be had from wells and while plants grow well during wet weather a period of drouth is very destructive. As the Nueces river empties into the bay it is said to be only semi-salt, but because of extra evaporation it is practically ocean water. The Nueces, being a very slow-running stream, brings a great volume of such forms of sediment as can be held in solution, and as the water for several miles above the mouth is even more quiet than that of the bay, this sediment slowly settles and forms a thick black ooze that can be readily raised to the higher ground by high water. This

rich black soil supports a luxuriant growth of trees, tangled vines and weeds. The vegetation of the area fertilized by the river is typical of the Gulf Coast country and sets off in sharp lines a contrast most striking. The high ground—the land outside of the old lake basin—is covered with grease-wood, Spanish bayonets, chaparral, and various forms of cactus.

We were located in a cottage built on a pier over the bay, and for a place in which to put away dull care and make faces at a Texas summer, it would be hard to duplicate. In the morning take a vasculum and ramble wherever something of special interest appears, collect some of the rare specimens, and after putting them to press, take a swim. Late in the evening, a trip would be especially enjoyable among the halophytes that were so plentiful just above high water line. Many kinds of sea-weeds are washed in by the waves and a small bunch is usually swarming with various forms of animal life—miniature crabs, lobsters, shrimp, clams and sponges. Some of these marine plants are very beautiful in form as well as color and texture. There are algae of various shades of red and blue and green, but a very common brown variety forms a rich sepia that blends with the more striking colors to make an artistic border. The long kelps are mostly under water so that when the bay is calm they appear as a submerged field of cultivated plants.

Possibly the salt cedar is the most striking tree. Calm, dignified, and aristocratic, it appears as a patriarch of all the trees and shrubs of the locality. Its gnarled trunk draped with a graceful fringe of delicately shaded green, the friendly trailing branches festoon a canopy just thick enough to make the shade complete without interfering with the circulation of the air. The sublime dignity and poetry of the surroundings add a rare zest to a lunch in the salt cedar gardens. Of the other cultivated plants that might be mentioned, the elite oleanders—red, white, scarlet and yellow—which grow so

abundantly and give color to the landscape. Then there are the palms—tall spires with large umbrellas formed of spreading fans or gracefully bending feathers.

The sea ox-eye (*Borrichia frutescens*) which grows along the margin of the bay is very interesting because it defies the hot sun and raises its head even when the beach is like molten brass. An excellent instance of adaptation is this low fleshy-leaved halophyte. Occasionally a bunch of alkali grass (*Distichlis maritima*) may form a hiding place for the little swift lizards while sea oats (*Uniola paniculata*) grows with less pretense but with a persistance that meets the conditions. Farther back the scalp lock (*Euthammia graminifolia*) flaunts its cylindric heads. In order that they may not be without all the symbols around which are grouped some beautiful and playful superstitions, the matrimony vine (*Lycium*) has a representative that compares favorably to some of the forms that have been so carefully cultivated for more than a century.

In the vast areas which might appropriately be termed the median shelves of the ancient salt water basin, it seems that every plant has spines. Here may be found various forms of prickley pear, Indian fig, pin cushion, Mexican beads, lady fingers and medicine bottles, besides dwarfed yuccas, sword cactus and many other cacti, but the thorny chaparral, cats' claws, mesquite and huisache are silent emblems of the principle of preparedness. Possibly the most formidable of the shrub-like cactus is the thorn bud (*Opuntia leptocaulis*) whose varying forms and lengths of sharp brittle spines stand like a phalanx against intruders, large or small. The little Mexican beads (*Mimosa pallida*) displays varying shades of green that are always restful to the eyes, and a vast hoard of little butterflies such as the lyside (*Kricongonia lyside*), the phaon (*Phycodes phaon*) and the southern snout butterfly (*Libythea carinenta*) are continually darting among them with a calm disregard for the thorns. The fruit of the Mexican beads are gathered by the Mexican children and strung on threads.

A large field of these low growing semi-desert plants is by no means an unpleasant sight. There are varying shades of green, from extremely light to extra dark, that blend admirably when surveyed from a distance so as to form something of a cloud effect. Just enough life in the form of birds, butterflies, and dragon flies is in evidence to form a fringe and break the set background of a rather quiet landscape. No artist could paint the delicate shades and tints as they merge into a deep blue sky or a long stretch of dusty road.

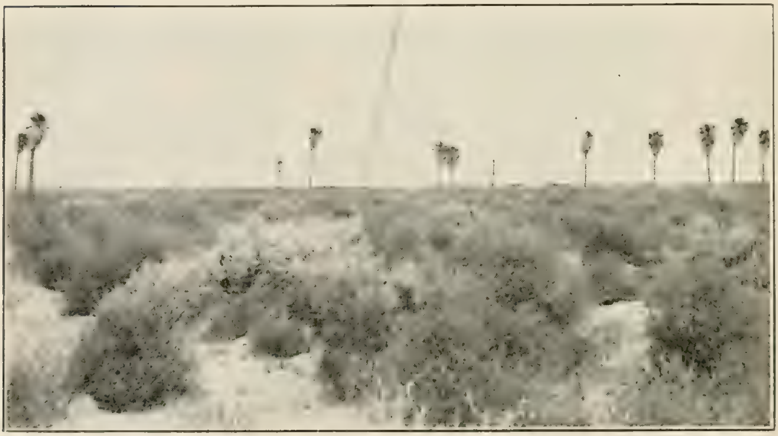
WEIGHT OF OUR NATIVE WOODS

IN ATTEMPTING to estimate the weight of a piece of wood, we are often deceived by its appearance. In general hardness is associated with weight, but this is not always a safe guide. Though the wood itself may be hard, the presence of numerous large ducts, through which the water travelled when the tree was alive, may have a considerable effect in lessening the weight of the specimen. It is stated that the weight of pure wood fiber is the same for all kinds of wood, but the pore space and the amount of moisture the wood contains accounts for the difference between various species. In a bulletin on the "Qualities and Uses of the Woods of Ohio" Professor William Lazenby gives a list of their weights newly determined whch we reproduce here through the courtesy of the Ohio Biological Survey. It is likely that the list contains some surprises for those who do not come much into contact with plants after they are worked up into lumber. One might expect, for instance, that the black walnut would be heavier than the elm and would scarcely regard the locust as heavier than either. The woods in the list are arranged in the order of their weight. The specific gravity given is only another way of stating the weight since it indicates how much a given

specimen weighs in comparison with an equal bulk of water. Anything with a specific gravity less than 1.00 will of course, float on water. None of our woods are heavy enough to sink in water, but several tropical species are said to do so.

	Weight cu. ft.	Specific Gravity.
Arbor Vitae (*Thuja occidentalis*)	22.28	.324
Catalpa (*Catalpa speciosa*)	21.72	.347
Balsam Poplar (*Populus balsamifera*)	21.99	.352
Black Willow (*Salix nigra*)	22.86	.366
Ohio Buckeye (*Aesculus glabra*)	23.43	.375
Hemlock (*Tsuga Canadensis*)	23.77	.380
Basswood (*Tilia Americana*)	24.00	.384
White Pine (*Pinus strobus*)	24.02	.385
Box Elder (*Acer negundo*)	25.15	.402
Cucumber tree (*Magnolia acuminata*)	26.63	.416
Red Mulberry (*Morus rubra*)	26.57	.425
Butternut (*Juglans cinerea*)	26.57	.425
Large-toothed Aspen (*Populus grandidentata*)	26.57	.425
Cottonwood (*Populus deltoides*)	27.15	.433
Chestnut (*Castanea dentata*)	28.28	.452
Red Cedar (*Juniperus Virginiana*)	28.28	.452
Red Elm (*Ulmus fulva*)	30.86	.494
Sassafras (*Sassafras variifolium*)	31.13	.498
Buttonwood (*Platanus occidentalis*)	31.13	.498
Black Ash (*Fraxinus nigra*)	32.27	.516
Black Walnut (*Juglans nigra*)	32.92	.527
Tulip Tree (*Liriodendron tulipifera*)	32.96	.528
Sweet Gum (*Liquidambar styraciflua*)	33.76	.540
Blue Ash (*Fraxinus quadrangulata*)	34.00	.544
Jersey Pine (*Pinus Virginiana*)	34.29	.549
Red Maple (*Acer rubrum*)	35.36	.566
Black Cherry (*Prunus Virginiana*)	35.82	.573
Pitch Pine (*Pinus rigida*)	35.82	.573
Tamarack (*Larix laricina*)	35.82	.573
Red Oak (*Quercus rubra*)	35.93	.575
Yellow Birch (*Betula lutea*)	37.72	.608
Shingle Oak (*Quercus imbricaria*)	38.00	.609
White Elm (*Ulmus Americana*)	38.65	.619
Hackberry (*Celtis occidentalis*)	38.65	.619
Blue Beech (*Carpinus Caroliniana*)	38.65	.619
Silver Maple (*Acer saccharinum*)	38.86	.622
Yellow Locust (*Robinia pseudoacacia*)	40.00	.640
Scarlet Oak (*Quercus coccinea*)	40.00	.640
Sugar Maple (*Acer saccharum*)	41.14	.658
Black Oak (*Quercus nigra*)	42.06	.673
Honey Locust (*Gleditschia triacanthus*)	42.69	.683
Coffee Tree (*Gymnocladus dioica*)	42.91	.687
Swamp White Oak (*Quercus bicolor*)	43.43	.695
Bitternut (*Hicoria cordiformis*)	44.39	.710
Beech (*Fagus grandifolia*)	44.39	.710
Pepperidge (*Nyssa sylvatica*)	44.50	712

	Weight cu. ft.	Specific Gravity.
White Ash (*Fraxinus Americana*)	44.50	.712
White Oak (*Quercus alba*)	44.85	.718
Chestnut Oak (*Quercus prinus*)	44.86	.718
Burr Oak (*Quercus macrocarpa*)	46.29	.741
Sweet Birch (*Betula lenta*)	46.57	.745
Persimmon (*Diospyrus Virginiana*)	46.58	.746
Ironwood (*Ostrya Virginiana*)	46.92	.751
Juneberry (*Amenanchier Canadensis*)	47.48	.760
Wild Crab (*Malus coronaria*)	47.66	.763
Mockernut (*Hicoria alba*)	48.73	.780
Shagbark Hickory (*Hickoria ovata*)	49.14	.787
Pignut (*Hicoria glabra*)	51.56	.825
Yellow Oak (*Quercus acuminata*)	55.72	.892



THE TWELVE APOSTLES OF THE COLORADO DESERT

AMONG the natural curiosities of our Southwest is an isolated group of twelve California Fan Palms growing in the open Colorado Desert of southeastern California, and shown in the accompanying photograph. They are locally known as "The Twelve Apostles," the appropriateness of which title is at once acknowledged by the traveler when he notices that one of the trees is blasted and its head entirely gone—the obvious Judas of the band.—*C. F. Saunders.*

THE WILD FLOWERS OF HAWAII

By Vaughan MacCaughey.

THERE seems to exist among people who are but slightly familiar with the tropics, and whose knowledge of equatorial regions is based largely upon casual reading and hearsay, a deep-rooted and widely spread misimpression concerning the floral marvels of the tropic jungles. Certain writers of a florid disposition, like the gardeners in northern conservatories, have packed within the narrow confines of a single description the gorgeous and spectacular floral wonders of a score of widely-separated regions. The riot of unfamiliar colors, the strange eccentricities of form and habitat, the weird gloom of the jungle, starred with fantastic bouquets—these have been compressed by facile imagination into restricted areas, whereas in fact they are far-scattered, and isolated by great stretches of relatively barren and insignificant vegetation.

One's first actual excursion through a tropic forest is customarily an experience of severe disillusion and readjustment of perspective. The somber hue of the heavy foliage is oppressive. The forest canopy, high above one, is remote and gloomy. The trunks and branches are strangled by tortuous lianas and smothered under a dripping envelope of epiphytes The soggy floor is densely covered with rapidly decaying vegetation; there is no familiar crisp leafy carpet, and there is a notable absence of bright flowers. Those plants that survive in the dense perennial shade are rich in varied greenery, but scant of blossom. In many places the ferns form a high, dense undergrowth, that is penetrated with difficulty. During much

of the year everything is water-soaked. The vegetation is engaged in a life-or-death struggle for head-room and sunshine; there is none of the sunny serenity of an eastern woodland. In the clearings the lianas and under-brush snarl into inextricable tangles. Frequently the trail must be carved out with machetes. The forest seems barren of blossom.

After a few trips, however, one's eyes become accustomed to the diversified greenery and the humid shade. A mental re-alignment takes place, almost unawares, which puts this somber background into the subjective background. Here and there the brilliant blooms appear. Rarely profuse in any one place, usually sequestered by the enmassing foliage, nevertheless, the presence of these tropic flowers gradually grows upon the consciousness, and one becomes aware of their charm and beauty. They become familiar, anticipated, and the long flowerless stretches are forgotten in the joy of seeing again a glowing mass of color against the luxuriant verdure of the woodlands that are forever green.

This paper is a rapid enumeration of the beautiful wild flowers that adorn the beaches, lowlands, valleys, and mountains of the Hawaiian Islands. It is based upon eight years of residence and field work in that beautiful island world of the mid-Pacific. Only those fairly abundant forms with showy or striking floral effects are included. Many of the rarer and smaller flowers possess beauty excelling that of the conspicuous ones, but of a finer and more subtle quality.

The most conspicuous and abundant flower in the Hawaiin forests is the *lehua* (*Metrosideros polymorpha*). This tree is the commonest of the native species, and grows at all elevations, from arid lava coasts, far up onto the rainy valley slopes and mountain ridges. As its specific name indicates, it varies greatly in stature and habit, from a stately tree of 125 feet, to a prostrate shrub scarcely lifting its head above the swamp grasses. The flower is an impressionistic cluster of deep scarlet,

stamens, an inch or more in length, and much longer than the inconspicuous petals and calyx. These beautiful pompons are arranged in terminal corymbs, and stand out showily beyond the small, close-set leaves. As the flowering season is practically continuous, any view from ridge or peak across the tree-tops is sure to disclose a generous sprinkling of the rich red blossoms, shining like birds against the gray-green background of the *lehua* foliage. Because of its abundant nectar, the *lehua* flower attracts great numbers of the native insects and birds, and is an important element in the food supply of these creatures. Many of the highly specialized Hawaiian birds known as "honey-suckers" are confined largely to the *lehua* forests.

In the humid valley floors and ravines of the lower forest zone are extensive groves of a handsome tree widely known and prized in the Pacific and Malayan regions. This is the *ohia ai* (*Eugenia Malaccensis*) known as "mountain apple" in English, because of the crimson, palatable, apple-like fruit. The flowers occur not only at the ends of the branches, but also on short spurs along the trunk and larger branches. Like its relative, the *lehua*, the flower is a delicate cluster of long, spreading, bright red stamens, that contrast charmingly with the glossy, rich green foliage. During the flowering season, in early summer, the shady interior of the tree seems to be filled with a delicate scarlet haze.

The *nohu* (*Tribulus cistoides*) is a common lowland flower, that also occurs on most of the low coral isles and atolls of the North Pacific. It is an herbaceous perennial mat-plant, with trailing hairy branches, and pinnate leaves. The light yellow flowers, axillary and solitary, are about two inches in diameter. They are conspicuous in the early morning, like sunbeams scattered on the greenery, but wither in the glare of the day. The fruit is armed with stiff spines, and woe to the barefooted native boy who inadvertently treads upon it.

A brilliant sea-shore shrub is the *ohai* (*Sesbania tomentosa*). This is a much-branching legume, six to twelve feet high; the leaves have eight to eighteen pairs of pinnae, and the large scarlet flowers are in loose axillary racemes. The natives are fond of the bright flowers, and the bush is often to be found in the vicinity of the little beach settlements, particularly along the arid leeward shores, where vegetation is scanty.

Another littoral plant beloved by the natives is the *kou* (*Cordia subcordata*). This tree was brought by them from their South Sea home, in the days of the long migrations. At one time it was abundant along the shores, but is now quite rare. The ancient name for the site of Honolulu was Kou, and referred to a famous grove near the shore. The broad, leafy crown cast a grateful shade on the hot beach, and the large orange flowers were plucked and strung in garlands. The flowers are campanulate, with a long corolla tube and a broadly expanded limb, five- to seven-lobed. The Hawaiians also prized the soft, durable wood for their carved bowls and dishes, as it took a beautiful polish, and exhibited a handsome wavy pattern of varied shades of brown.

The Pride of India tree (*Melia Azedarach*) is not indigenous to Hawaii, but was introduced many years ago, and is now thoroughly naturalized on the lowlands and in the valleys. It is one of our few deciduous trees. The abundant clusters of delicate lilac-blue flowers appear with the tender new leaves, and cover the bare frame-work of branches with a lovely diaphanous drapery of delicate lilac and green. This handsome tree is common along the roadways, and in the neighborhood of the native settlements.

Another deciduous tree of the lowlands, with showy flowers, is the *wili-wili* (*Erythrina monosperma*). This is a leguminous xerophyte, with squat gnarled crown and short stocky trunk. The sparse foliage is three-foliate, and is shed in late summer. After the rains the flowers appear, preceding

the new leaves. The flowers are pale scarlet or orange, occasionally creamy yellow, and are clustered in axillary racemes. The standard of the flowers is one and one-half to two inches long and nearly as broad, and is quite showy. The Hawaiians had an old proverb which prohibited sea-bathing by the children while the *wili-wili* is in flower, for at that season the shark was supposed to be particularly aggressive.

Immortalized in Hawiian song and legend are the bright yellow flowers of the *ilima*. Of these were made the choice *leis* or garlands for which the native had a passionate fondness. The *leis* of twisted orange-yellow crepe-paper which the native women sell at the wharves on "steamer day," and which tourists bring back to the mainland as mementos of their happy visit, are meager imitations of the glowing *"lei ilima"* itself. The flowers are gathered from a low shrub *Sida fallax*. There are a number of other closely related species which also have rich yellow blossoms, belonging to the Mallow family. The *ilima* is abundant on the dry lowlands, and adorns the dreary lava flows and wastelands with its cheerful bloom. The plant itself is three or four feet high, and shows its xerophytic character by its covering of dense white velvety tomentum. It flowers continuously, and constitutes one of the few showy elements in the somewhat scanty lowland flora.

Here and there on the semi-arid lowlands, on the hot coral plains and lava fields, and along the sandy shores, occurs a low straggling shrub with large fragrant flowers. The white petals are two inches long, and the cup which they form is filled with beautiful delicate white stamens, about three inches long, and projecting well beyond the petals. This is the *maiapilo* (*Capparis Sandwichiana*). The flowers are solitary in the axils of the round, entire, pale green leaves. The straggling habit of the plant itself is not particularly attractive, but the delicate flowers, opening in the cool of the day, are as graceful as aigrettes.

Two very abundant flowering shrubs of the drier lowlands and valleys are the *klu* (*Acacia Farnensiana*) and the *koa-lei* (*Leucaena glauca*). Both were introduced many years ago, and are now thoroughly naturalized. The spiny *klu* has globular heads of tiny, fragrant, rich yellow flowers. The floral heads of the *koa-lei* are larger—an inch in diameter—and white. These mimosaceous plants frequently become tall shrubs or small trees, and are continuously and profusely laden with bloom. The *klu* has formed extensive thickets or chaparral on the Oahu lowlands, and is also abundant as an undershrub in the valuable *kiawe*, or mesquite (*Prosopis juliflora*) groves.

A low shrub, also of the Legume family, that enlivens with its masses of yellow flowers the barren lower slopes and open places in the drier woodlands is the *he-uhi-uhi*, (*Cassia Gaudichaudii*). The flowers are clustered in axillary racemes, and are plentiful after the winter rains. The individual flower is not especially conspicuous, but the mass effect is noteworthy.

A number of representatives of the Convolvulus family are common, and possess showy "morning-glory" flowers. The *pili-kai* (*Argyreia Tiliaefolia*) is a stout woodly liana, occurring here and there on the lowlands and valley floors. The pale purple flowers are 2½ inches long, and abundant among the large heart-shaped leaves. The *po-hue-hue* (*Ipomoea pes-caprae*) is characteristic of Hawaii's coral beaches, like those of many other tropical strands. Its prostrate creeping stems often attain a length of thirty or forty feet, with large, glossy, succulent two-lobed leaves, and purplish-pink flowers two inches long. *Ipomoea bona-nox*, native of India, climbs over our lowland vegetation, and forms great masses of foliage. The white flowers are very showy, with a long slender corolla-tube of three to four inches, and a spreading limb of three to four inches in diameter. The blossoms open in the cool of the afternoon, and remain open throughout the night, wilting

under the morning sun. *Ipomoea tuberculata*, the *koali*, is another vigorous twiner, common in low and dry rocky places. The flowers are delicate purple red, two inches long. Another *koali, Ipomoea insularis,* is very common in the lower woodlands, where it envelopes the shrubbery and smaller trees with its dense entangling masses of foliage. The fragile azure-blue flowers are two to three inches long.

The *mauna-loa* (*Dioclea violacea*) is a tall, woody leguminous liana. It climbs up the coco-palms along the beaches, and festoons shady groves in the lowland gulches. The leaves are three-foliate; the flowers are clustered at the ends of stiff peduncles, twelve to fifteen inches long. The bold flowers are deep blue or violet. *Canavalia galeata*, the *awiki-wiki* of the natives, is a noteworthy leguminous liana, and often climbs to great height. The pink or purple flowers are borne in clusters at the ends of axillary peduncles four to eight inches long, and are of distinct beauty. This vine occurs both on the lowlands and in the lower forest zone, up to two thousand feet elevation.

An introduced leguminous vine, *Mucuna urens,* the "cow-itch" of South America, is found on the uplands of Maui and Hawaii. The young shoots and the pods of this tall climber are clad with silky, stinging hairs. The leaf is three-foliate, and very waxy underneath. The long axillary peduncles bear fascicles of ten to fifteen flowers; the flowers are large, two inches long, and a lively bright yellow, with some red.

A strong vigorous liana, the leguminous *Vicia Menziesii,* is a characteristic high mountain form, as it is limited in range to the upper margins of the extensive forests on Mauna Kea and Mauna Loa, Hawaii, at an elevation of seven thousand to eight thousand feet. The vines are very leafy, the leaves are six to seven inches long, with eight to twelve leaflets, and terminating in a compound tendril. The axillary inflorescences each comprise six to eight large pale purple flowers, one to two

inches broad. The vine climbs to a height of twenty to thirty feet, and drapes the forest with its luxuriant foliage and bouquets of flowers.

A brilliant flower of the dense woodlands is the scarlet *ka-iwi* (*Strongylodon lucidum*). This is a high-climbing woody leguminous liana, with herbaceous branches. It adorns the tree trunks in the shady forest with its graceful foliage, shot here and there with the pendant flaming racemes, which are ten to eighteen inches long. The flowers are like those of the bean or pea in form, with a showy reflexed standard, and a long scimiter-shaped keel. This last peculiarity has given the native name *nuku-iwi,* which compares the keel with the long curved beak of a Hawaiian red bird. The leaves of the *ka-iwi* are glossy and three foliate. This lovely vine occurs only in the humid forests, at elevations of from one thousand to three thousand feet above the sea. It is of marked beauty and certainly merits horticultural study.

Our Hawaiian species of hibiscus constitutes one of the most beautiful floral groups of the lower and middle forest zones. There are five species, all with large showy flowers—white, pink, red, and yellow—usually solitary and axillary. The cosmopolitan *hau* tree (*Hibiscus tilaceous*) a sprawling littoral species, has rich yellow flowers, with a purple brown center. As the flowers wither they become suffused with red. The *akia-hala* (*H. Youngianus*) with pink flowers two inches long, is a small undershrub occurring in marshy places and abandoned taro patches on the lowlands and in the valleys. *H. Brackenridgei,* a shrub of four to five feet, with deciduous spines and conspicuous yellow flowers, shows preference for the semi-arid leeward ridges. The white *kokio* (*H. Arnottianus*) is a tall shrub or small tree, ten to twenty-five feet, plentiful along stream-beds in the upper valleys and ravines throughout the rain-forest. The flowers are four or five inches long, with an exserted red staminal column of four to six

inches. Our rarest species is the red *kokio* (*H. kokio*) a tall straggling shrub of eight to fourteen feet. The flowers are small, two and one-half to three inches, rich red, with a conspicuous red staminal column, which has horizontally spreading stylar branches. One's first glimpse of a native hibiscus bush, leaning out over a mountain stream, its lovely flowers starred against the glossy greenery of the foliage, is a memorable experience.

The Hawaiian violets are unique in all being woody shrubs, sometimes reaching six feet in height, but with flowers like those of the familiar violets of eastern woodlands and gardens. We have half a dozen species, of the genus *Viola*, and all confined almost exclusively to the excessively humid summit ridges and bogs. In certain favorable localities they are so abundant that they richly perfume the humid air with their delicious fragrance. One species, *V. helioscopa*, has lovely large pure white blooms which project singly beyond the stiff, dark green foliage.

(*To be continued.*)

NOTE *and* COMMENT

Lignum Nephriticum.—Three or four centuries ago, the dabblers in science discovered a remarkable tropical wood which had the property of causing pure water in contact with it to become highly fluorescent. If chips of the wood were placed in water, or if water was poured into a goblet made of the wood, it became golden yellow in sunlight and a beautiful peacock-blue by reflected light. This curious property was assumed to be indicative of medicinal properties in the wood and its use in kidney troubles soon earned for it the name of *lignum nephriticum*. Although known for so long, the exact botanical identity of the plant that supplied the wood has remained in obscurity almost up to the present. From the investigations of W. E. Safford of the United States Department of Agriculture, it now appears that the wood of more than one plant has the power to make water fluorescent. The best known of these is probably the Mexican shrub, *Eysenhardtia polystachya*, but a Philippine species, *Pterocarpus Indicus*, is nearly as renowned. Since the genus *Pterocarpus* is also represented in Mexico, it is possible that other species there have similar properties just as other species of *Pterocarpus* in the Old World are known to have, though in a lessened degree.

Growth Periods of the Elm.—In spring, the elm buds, like those of other trees, throw off their protecting scales and by a lengthening of the internodes in the bud and the development of the embryo leaves forms leafy twigs a foot or more long. In the woody plants of the tropics, growth may proceed

almost continuously, and when such plants are moved into temperate regions frost finds them without well developed terminal buds, but in our forest trees, the twigs grow to a certain length and then the plant rests whether cold has come or not. The elm, however, is in a different category. Early in the year it completes its spring growth, but along about August it suddenly starts up anew and within a few weeks lengthens its branches several inches more. The bright yellow-green of the new leaves forms a striking color contrast with the foliage produced earlier in the year. A number of other trees have the habit of producing a second growth late in the season, but there are few in which it is as noticeable as it is in the elm. The cause of this resumption of growth is generally thought to be connected with the amount of moisture in the soil, but the elm appears not to be so influenced, for it produces its new growth just as readily in the midst of a drouth as during more propitious seasons.

Distribution of the Oaks.—The genus *Quercus,* to which the oaks belong, is far more widespread and contains more species than those who have seen only their native species are likely to have imagined. We commonly assume that the oaks are a typically northern genus, but many species are found in the tropics. The genus seems to be especially well represented in Japan, Formosa, China, Burma, Java, Sumatra, Borneo, the Philippines and other tropical islands. South America and Africa, however, have no oaks. A writer in a recent number of the *Japanese Botanical Magazine* lists nearly 450 species of oaks. About half of these, formerly placed in the genus *Quercus* are now to be found in the genus or subgenus *Synadrys.* Many of the species in this latter group have the nuts entirely surrounded by the involucre or cup, in this suggesting their relation to the walnuts and hickories. A large number of the tropical species have entire leaves and of course, are evergreen.

Periodicity in Plants.—Rarely, if ever, does growth proceed continuously, even in the tropics. In many northern regions, the winter puts a stop to growth, and a drouth in summer may do likewise, but in the tropics where warmth and moisture are always plentiful the plants still have their resting spells and often take a vacation at what seems the most inopportune of times. Resting is also more of an individual peculiarity in the tropics and one plant may suddenly shed its leaves when the other members of its species retain them. Not infrequently, a single branch may thus rest, or it may resume growth as other parts of the plants are preparing for a dormant period. Much evidence has been accumulated to show that periodicity in plants is due to internal causes, but the prevailing idea seems to be that it is due to external conditions which are determined largely by heat, moisture and oxygen. It would be difficult, however, to explain some cases of periodicity by these latter factors. For instance, trees rapidly increase in growth after midsummer, regardless of either temperature or moisture. In July or August, new rifts in the bark of all our common trees show how rapidly new wood and bark are being added to the trunks.

Canada Lily in Northern Iowa.—The meadow lilies in the writer's locality (Emmet County, Iowa) are found rather sparingly on low prairies but are abundant in a local meadow where they present quite a display when in bloom. The flowers of these plants differ somewhat from the typical *Lilium Canadense* of the manuals. They are orange or orange-red and have the perianth segments not merely spreading as in the typical form, or even turned back as in the Turk's cap lily (*L. superbum*) but they are reflexed and closely curled together, meeting and overlapping behind the flower. Thus in a fully opened flower, not even the points of the perianth divisions project outward or backward but are curved together so that both the back and face of the flower present somewhat

the same outline. Specimens of this form have been referred to *L. supurbum*, but the leaves are arranged in whorls to the top of the stem with the veins beneath rough as in the true Canada lily. The Turk's cap has the leaves smooth on both surfaces. The plant blooms about the first week in July—never so late as August as the other species is said to do and there is not, as a rule, more than five flowers to a stem. One botanist has suggested that it may be a transition in this territory from *L. Canadensis* to *L. superbum*. These plants seem rarely if ever to perfect fruit here. Most of the plants growing in meadows and on prairies are cut down about flowering time, but there are generally some left in woods and along their borders but these do not seed and I have never found a mature capsule. It would be interesting to know if either of the two species of lily mentioned ever have their flowers shaped as here described in other parts of the country or if this is an entirely local form.—*B. O. Wolden, Wallingford, Iowa.* [Britton's Manual mentions this form but cites no locality for it.—Ed.]

Queen Anne's Pocket Melon.—It is likely that few people would recognize the fruit which bears the title at the beginning of this note, nor is it likely that they would be helped much in their identification if told that it is also called dudaim melon and pomegranate melon. It is a rare species in our part of the world and seeds are not offered by the general seedsmen. The fruits, however, are interesting specimens, round, bright orange in color, and about the size of a hen's egg with a decided fragrance which suggests that of the may-apple (*Podophyllum*). The two plants are only very distantly related; for the species under discussion is really a muskmelon (*Cucumis melo*) and is called the variety *dudaim*. A related form has fruits of about the same size, but lemon-yellow in color and lacking in fragrance. This is the variety *chito*. It is commonly called vine peach, garden lemon, melon apple, mango melon, and orange melon and is edible when cooked.

There are several other varieties of the muskmelon, the better known being the cantaloupe (var. *Cantaloupensis*), the nutmeg melon (var. *reticulatum*), and the winter or casaba melon (var. *inodorus*). How this tiny hard-skinned melon came to be named for Queen Anne is hard to say. In any event, her royal highness seems to have a better taste in choosing fruits than she does in choosing laces if the farmer is any judge of values.

Types of Vegetation.—To the casual observer, the wild plants seem to grow without definite order almost anywhere, but the botanist knows that it is not mere chance that determines the location of flowering plants. Occasion specimens, it is true, may flourish out of their natural habitat for a time, but a patch or colony of one species is almost certain to be found in localities to which it is best suited. The division of all vegetation into drouth plants or xerophytes, water plants or hydrophytes, and middle-ground plants or mesophytes is a recognition of the important part played by moisture in determining habitat. After moisture, the character of the soil has much to do in limiting the range of plants and in forming restricted areas in which only certain types of vegetation can grow. To name but a few of these, there are the bogs, marshes, ponds, dunes, heaths, fields, woods, thickets, pastures, cliffs, meadows and cultivated grounds. Certain plants are typical of each of these regions and are often so related to the habitat as to be unable to thrive in any other. One has only to consider the water lily, pitcher plant, walking fern or cat-tail to realize the force of this. As a matter of fact, one can make pretty clean-cut lists of the plants of each region. It is only the weeds that can grow in a variety of situations, and this ability accounts largely for their being weeds. Those who have pretty well exhausted the resources of their home flora may find a new interest in listing the plants according to their habitats. It is best to begin with plants of very definite areas such as ponds, dunes, or bogs. After the typical plants have

been set down, one may be puzzled to decide whether the remaining forms are true denizens of the region or not, but a little investigation will usually show that one locality has more claim to a given species than any other. Just because a few cat-tails are found in a bog is no sign that they are naturally bog plants. They are really marsh plants though a few may linger in a bog for some time. To discover the interest there is in arranging plants according to habitat, set down a list of the bog plants of your region, taking care that no plant except those that naturally grow in cranberry or sphagnum bogs is admitted to the list.

Color Forms of Lilium Canadense.—There are no red specimens of *Lilium Canadense*—if you leave it to the books. Harper's "Guide to the Wild Flowers" calls them golden yellow, Mathews "Field-book of American Wildflowers" names them buff-yellow, Gray and Wood both call the flowers yellow or orange, while Britton alone hints that they may be red. Most of the botanical books are made in the East where this lily is nearly always yellow, which may account for the color attributed to it, but notwithstanding this, the flowers are practically always red in northeastern Illinois and in southern New York. Possibly the difference in color is after all a north-and-south difference, the flowers being yellow in the southern part of the plant's range and red further north. The flora of eastern New England has many elements of more southern regions in it and its lilies should naturally be yellow. Further notes on the distribution of the color forms of this species are needed. Meanwhile we have two additional notes on the subject. Mr. Leston A. Wheeler, Townshend, Vermont, writes "As regards the color forms of the meadow lily mentioned in the February number of the *American Botanist,* it may be of interest to note that in West River valley both the red and the yellow flowered forms occur. On July 10th of the present year, in company with a friend, I found both forms and noted

that in the red form the segments of the perianth were shorter, broader, and less recurved than in the typical form. We also noted various intermediate forms. There seems to be no definite line where one form stops and the other begins. At the most the extreme red form, accompanied as it is with the differences in the perianth, might be reckoned a variety but not a separate species on account of the intermediate forms." Mr. C. L. Gruber, Kutztown, Pa., says "*Lilium Philadelphicum* is not common in this locality and all the flowers I have seen of it were of the usual red-orange color, but *Lilium Canadense* is common, and while the majority of the flowers are yellow, I have found them in colors ranging from clear yellow to rich red. During this summer I have found a number of meadow lily plants with flowers of the intermediate colors, red predominating in some, yellow in others."

Unusual Root-crops.—"In the alpine or Andine belt of Peru, where the potato is the chief crop, three other root-crops are generally grown by the same methods and often in the same rows with the potatoes. These Andine root-crops are the oca (*Oxalis tuberosa*), the anu (*Tropoeolum tuberosum*), and the ullucu (*Ullucus tuberosus*). The tubers of all three plants are remarkably alike and similar to some of the varieties of potatoes, although the plants have no relation to potatoes or to each other. The oca is a relative of our sheep-sorrel, the anu of the common nasturtium and the ullucu of the Madeira vine. Though not attaining the size of large potatoes, the other tubers have a more attractive appearance and seem to have even better keeping qualities. In the lower part of the potato belt there is another root-crop, the yacon or llacon (*Polymnia sonchifolia*), comparable to the so-called "Jerusalem" artichoke which is supposed to be a native of Mexico. It produces large compact clusters of thick, fleshy roots tapering at both ends and with a strong external resemblance to sweet potatoes. The flesh is crisp, juicy, and has

a pleasant sweetish flavor rather better than that of the Jerusalem artichoke. At elevations below 6,000 feet another series of root-crops is grown consisting of numerous varieties of rumu (*Manihot*), unchuca (*Xanthosoma*), *achira* (*Canna*) and unguna (*Curcuma.*)—*O. F. Cook in National Geographical Magazine.*

Chewing Gum an Aid to Gardening.—Tne harm that results from chewing gum, like that from chewing tobacco, depends somewhat on who does the chewing and why. Some of the sphynx moths begin to chew tobacco as soon as they are born and keep it up until fully grown without being harmed by it. Their nerves are not shattered, their growth arrested nor their digestion impaired, for they are among the largest and strongest of their kind. There are times, also, when chewing gum may be defended. A lady of our acquaintance has discovered that chewing-gum is an ideal substance for sticking the Boston ivy and other vines to their supports until they take hold for themselves. As soon as this fact becomes generally known we expect all gardeners to throw away their tobacco and lay in a stock of gum.

Mayapple with Multiple Fruits.—In this magazine for August 1915 we illustrated a specimen of mayapple (*Podophyllum peltatum*) with five fruits instead of the one ordinarily seen. At the time, it was not known whether the extra fruits were produced by additional flowers, or whether the phenomenon was due to an increase in the number of carpels in the ordinary flower. That this species occasionally has more than one carpel in a flower had been earlier noted by Gray, but that the occurrence is somewhat rare may be inferred from the fact that other manuals do not mention it. A visit to the haunts of the aberrant specimens when they were in bloom this year, showed that the multiple fruits are due to extra carpels and not to additional flowers. This is an interesting instance of doubling akin to that seen in the production of extra petals, and all the more

remarkable in this species because it belongs to a family which has typically single carpels. Plants with extra fruits are now growing in the editor's garden.

FRUIT OR VEGETABLE.—Botanists are often importuned by their friends to decide whether certain structures are fruits or vegetables, though it would appear at first glance as if everybody should know that a fruit results from a flower while anything that is alive and not an animal is a vegetable. Fruits, therefore are always vegetables but all vegetables are not fruits. It has remained for a New York judge, however, to make a legal decision in the matter, and according to reports, he has ruled that anything that can be eaten raw is a fruit. Onions and radishes therefore ought to be fruits, but they are not, despite the legal opinion.

BITTERSWEET FOR INDOORS.—Autumnal hedgerows and thickets owe part of their charm to the scarlet-seeded pods of the climbing bittersweet, or wax work (*Celastrus scandens*), a widely distributed native vine that every lover of a country ramble knows. Twisting sprays of the flaming berries are very ornamental, and if brought home and twined over book case and mantel, glow cheerily indoors all winter long. For the best effect, the sprays should be gathered in early September before the pods, which are orange yellow and completely hide the scarlet-arilled seed, have split open. The warmth of the room will cause them to open and the arils will then keep their brilliancy of color much longer than when the pods have been allowed to open outdoors.—S.

TREE CISTERNS.—The baobab tree (*Adansonia digitata*), a member of the hollyhock family common in the Sudan is one of the freaks of the vegetable world. It has a large bottle-shaped trunk which, though scarcely reaching the height of sixty feet, is often more than a hundred feet in circumference and is therefore one of the largest of plants. The stubby branches which spring mostly from the top of the stem are so

broad that the natives can sleep on them. The interior of the trunk is soft and spongy and, as in other trees, may decay and form large cavities in which rain water accumulates. Acting upon this hint from Nature, the natives of Kordofan have hollowed out the trunks of many specimens and in the rainy season fill them with water for use when the rains cease. A hole is often bored near the base by means of which the water is drawn off as wanted. In a recent *Kew Bulletin*, a note from an officer in the Darfur campaign mentions these trees as follows: "On our side of the border in Kordofan, they have no water for perhaps hundreds of miles and live in the dry season on water stored in hollow trees called tebaldis. They are ugly, bottle-shaped trees, all trunk, from six feet to twenty feet thick and a good one holds 1,000 gallons. Each family owns certain trees and each tree has its own name. They scrape a small pond at the foot and after a shower everybody turns out to fill tebaldi trees. A man stands at the top of the bole, about twenty feet up, hauls the water up in a skin bucket and pours it into the tree. It keeps very sweet and is better than well water." The fruits of the baobab are oval, brownish green, about the size of a cucumber and contain an edible pulp of which the monkeys are very fond. From this fact the tree is some times called the monkey bread tree.

EDITORIAL

For the benefit of our newer subscribers who, unaccustomed to our methods, expect this magazine to come out at very definite intervals exactly three months apart, it is necessary to explain that theoretically the magazine is issued on the 20th of February, May, August and November, but practically it comes out whenever the editor has time to put it together. The fact is, that since the magazine, unlike the best sellers, depends upon subscriptions instead of advertising for its revenues, the returns do not justify employing an individual on salary to look after it. The significant point is that the magazine has always paid its bills and has issued more than 100 numbers without finding it necessary to combine two issues in one as is often done. Every number will appear ultimately. Fortunately the nature of the matter published does not depend upon any set date for its value. We surmise that even the back numbers may provide rather interesting reading to those who have not seen them and to some of those who have. A year's subscription, therefore, is in no sense a subscription for the calendar year. It means the four numbers that comprise a volume. Subscriptions are begun with the number current when the subscription is received, unless otherwise ordered. Recent subscriptions are therefore begun with the present number which, though issued in autumn, bears a summer date.

* * *

Every little while we find in the public prints articles of misinformation which cause us to agree with the famous aphorism of Josh Billings that "It is a great deal better to know

less, than to know so much that ain't so." Our reflections are directed anew to this observation by an article in *Something to Do,* in which a prominent New England author of outdoor books attempts to direct children in a hunt for mosses, but succeeds in mentioning only plants that by no stretch of the definition can be regarded as true mosses. He lists the gray moss (*Usnea*) which is a lichen, the club moss (*Lycopodium*) one of the fernworts, the reindeer moss (*Cladonia*) another lichen, and the scale mosses which are bryophytes but not true mosses. We cannot understand why our author was so moderate as to stop here. He could, with as much warrant have added the Spanish moss (*Tillandsia*), the flowering moss (*Pyxidanthera*), the ditch moss (*Elodea*), the rose moss (*Portulaca*) and the moss pink (*Phlox*). All these are as much mosses as any that he did mention. Never, even by chance, do the newspapers slip in an authentic article on plants. A rather extended reading of such literature inclines us to the opinion that the selection of matter for reprinting is usually entrusted to the office boy.

* * *

It has been recently proposed that we get together a group of people interested in plants for the simultaneous recording of certain facts about plants. The plan is to take up some question and call for observations on it from all interested and from these reports to make up a composite report to be published in this magazine. Already a considerable number have asked to be included in the list and we would be glad if all of our readers who are interested would join us. There are no dues, fees, or obligations of any kind. All we ask is such information as each can supply as different subjects come up. The subjects will vary with the seasons. Perhaps it may be a list of the fragrant flowers to be constructed, perhaps data on the time certain flowers open or stay open, perhaps a list of herbs that bear berries, etc., etc. Replies can usually be sent in on a post card. Those who will join us in this new kind of botanizing

should send in their names as soon as convenient. Reports will not be compulsory but we hope to have full reports each quarter. The first subject will be announced in the next number.

* * *

A joint resolution was recently introduced in Congress for the purpose of making the mountain laurel (*Kalmia latifolia*) the national flower, and the unthinking public has gone in for it with a whoop. A national flower, however, cannot be made by fiat. We may legislate till the cows come home, we may organize societies to advocate the merits of our favorite flower, we may write letters to the papers and we may get children and other childlike individuals to select a national flower by vote, but until some plant looms large enough in our national history to merit the title, we shall have no national flower that the title really fits. In every community there are certain individuals bent on filling long felt wants even if they have to first create the aforesaid wants. It seems to be some individual or group of individuals of this kind who are worried about the national and State flowers. The sentimentalist thinks how lovely it would be if his State and nation had a distinguishing flower, such as certain countries of the Old World have, and immediately rushes off to the legislature to get the error corrected. He never stops to think that a national flower must be significant to be acceptable. The State flowers of other countries are intimately connected with historical events, and any real national flower for the United States will have the same origin. It is amusing, therefore, to see legislatures composed of men too woefully lacking in plant-lore to know a fern from a carrot, adopting as State flowers, plants not native to the State, or even to the United States. As for the mountain laurel, its restricted habitat, its short season of bloom, the difficulty of making it grow at all in most of the States, to say nothing of its habit of crouching in the shelter of stronger species, makes

it about the worst specimen imaginable for a State flower. We have a suspicion that some New Englander suggested it originally. There is reason enough for applying such names as sunflower, palmetto and pine tree to certain of the States and reason enough for these States adopting the particular species named as their floral emblems, but for others to choose the rose, violet, buttercup, golden-rod and the like is sheer nonsense. Even when the selection is appropriate, it is not always safe to assume that it will be adopted. We do not anticipate that the nutmeg flower will ever be adopted by one of our commonwealths as the State flower. Perhaps, however, it is just as well to let the lawmakers amuse themselves with botanical legislation. It will keep them out of other mischief meanwhile.

BOOKS AND WRITERS

The Lorquin Natural History Club of Los Angeles, California, has issued the first number of a monthly publication to be known as *Lorquinia*. Notes on local natural history fill the pages of the first issue. A magazine of this kind ought to do much to advance an interest in nature in the region which it serves.

A 40-page publication entitled "Flowers for the Hardy Garden," really the catalog of the Twin Larches Nursery, West Chester, Pa., is one of the few things in this line that appeals sufficiently to the reviewer to get a notice here. It reads as if it was written by a man who really understood and loved his specimens. Moreover, it is the first catalog we have seen that gives sufficient information about the individual species to enable one to form a definite idea of their appearance and where and how they should be planted in the border. This catalog is going on the special shelf where we keep a few good ones that we consult every little while. Probably our flower

gardening readers will also find it of interest. It is mailed free.

It seems to be settled, at least by the botanists, that a text-book of Botany should begin with the structure and physiology of flowering plants, pay some attention to the lower forms of plant life, and end with more or less matter relating to evolution and plant breeding. If this be the most desirable arrangement—which we are sometimes inclined to doubt—we can only judge new books by the fidelity with which they follow scholarly tradition and the facility shown in presenting the subject in intelligible form. A new volume entitled "Fundamentals of Botany" by C. Stuart Gager, Director of the Brooklyn Botanic Garden, is an interesting addition to the books of this class which depend upon the method of presentation for much of their attractiveness. In it, old topics are made new by a very modern and spirited treatment, and a wealth of new, or at least unfamiliar, illustrations adds to the value of the text. The book, however, is far too exhaustive and circumstantial for the use of high school pupils, but it should meet the needs of college students admirably. The chapters on experimental evolution, heredity, and kindred subjects supplies a want often felt in books of this nature. The book is well printed, contains nearly 600 pages and is bound in flexible covers. It is published by P. Blakiston's Son & Co., Philadelphia, at $1.50 net.

Vol. 22. No. 4 Whole Number 111

THE AMERICAN BOTANIST

NOVEMBER, 1916

25 Cents a Copy; $1.00 a Year

WILLARD N. CLUTE & CO.

JOLIET, ILLINOIS

The American Botanist

A Quarterly Journal of Economic & Ecological Botany

WILLARD N. CLUTE, EDITOR

SUBSCRIPTIONS.—The subscription price of this magazine is **$1.00** a year or $1.50 for two years, payable strictly in advance. Personal checks on small or distant banks must contain ten cents for collection fees. The magazine is issued on the 20th of February, May, August and November.

BACK NUMBERS.—Volumes 1 to 10 inclusive consists of 6 numbers each, Vols. 11 to 13 of 5 numbers each and all later volumes of 4 numbers each. The first 18 volumes may be had for 75 cents a volume, or the set will be sent for $9.00. A full set contains 2312 pages.

THE FERN BULLETIN

In 1913, at the completion of its twentieth volume, **The Fern Bulletin** was consolidated with this magazine. The back volumes average more than 100 pages each, and since they cover the entire formative period of American Fern study they are invaluable for reference. The majority of new forms discovered in recent years have been described in its pages. First six volumes out of print. A set of vols. 7 to 20 will be sent for $7.00. An extended description of the contents of the volumes may be had for the asking.

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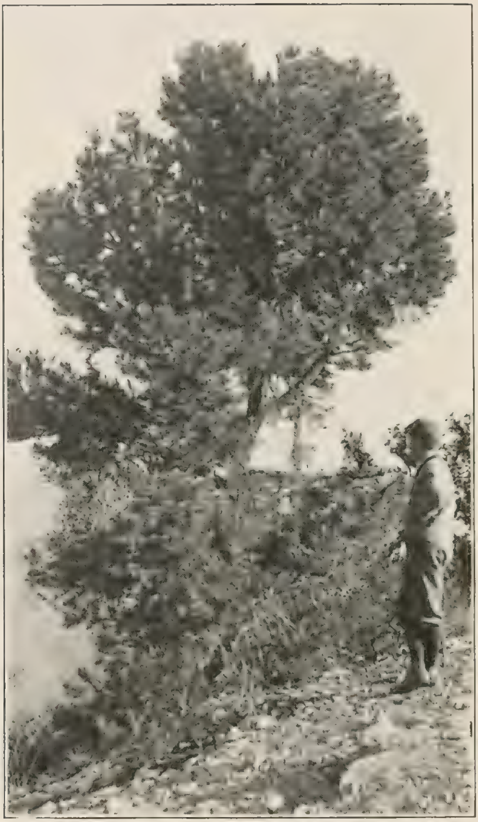


OSSAWATOMIE PINE TREE.

THE AMERICAN BOTANIST

VOL. XXII JOLIET, ILL., NOVEMBER, 1916 No. 4

The summer warmth has left the sky,
The summer songs have died away;
And, withered, in the footpaths lie
The fallen leaves, but yesterday
With ruby and with topaz gay.

Yet through the gray and sombre wood,
Against the dusk of fir and pine
Last of the floral sisterhood,
The hazel's yellow blossoms shine.

—Whittier.

THE OSSAWATOMIE PINE TREE

By Charles Francis Saunders.

ONE of the trips expected of every tourist in Southern California is by the remarkable electric railway to the top of Mount Lowe—a peak of the Sierra Madre of California. On the very summit of this peak stands a small tree which has rather unique pretensions to interest. It is a nut-pine of the sort known botanically as *Pinus monophylla*—the single leaf pine—and is the solitary specimen of its species within a radius of many miles.

A generation ago on the flank of this mountain, was the home of Jason and Owen Brown and their sister Ruth Thompson, children of John Brown, the Abolitionist. One autumn day in 1887, the two brothers came upon this little tree and

noticed that rain and wind had so exposed its roots that its hold on life was precarious. Taking pity on its plight, the kindhearted men brought earth in their tin dinner bucket, covered the roots and built about them a support of stones. In time the story of how the tree owed its life to the sons of John Brown of Ossawatomie gained for it the local name of the "Ossawatomie pine tree".

It is still a thrifty specimen, but of the thousands of annual visitors to Mt. Lowe, few know of the thread that binds this sturdy little pine with one of the stirring epochs of our nation's history; for Owen Brown was the companion and able lieutenant of his father in the latter's picturesque carrer both in Kansas and at Harper's Ferry. Owen died in 1889 in his cabin a few miles from this pine tree; and his solitary grave, marked with a rude granite head stone, crowns the summit of one of the Sierra foothills close to his old mountain home.

HOW PLANT FOOD IS FORMED

By Willard N. Clute.

THERE is probably no phase of botany about which so many misconceptions exist in the popular mind as the formation of plant food, and the gardener, nurseryman and plant lover share in the general obfuscation. Nearly everybody seems to think that plants get their food from the soil, entirely overlooking the fact that a large number of plants, such as perching plants or epiphytes, thrive though not rooted in the soil. As a matter of fact plants get their food from their leaves—at least that is where it is made.

Plants differ from animals in that they form food from simple chemical elements, while animals are unable to do this and can only take the foods formed by plants and break them down into their original elements again. When it comes to the

use of food, however, plants are like animals and digest, assimilate and break it down in practically the same way.

It is not true that plants differ from animals by giving off oxygen in breathing while animals give off carbon-dioxide. In breathing, plants and animals are exactly alike so far as the gaseous exchange is concerned. Both take in oxygen and give off carbon-dioxide. Where plants really differ from animals is in possessing another function, peculiarly their own, known as photosynthesis, by means of which food is formed. In this process, carbon-dioxide *is* taken in and oxygen given off—just the reverse of breathing. This latter exchange rather overshadows that which results from breathing and has probably given rise to the popular misconception regarding it.

Plant food is formed in the leaves and other green parts of plants from the carbon-dioxide absorbed from the air in photosynthesis and soil water taken up by the roots. The energy necessary to combine these into food is secured by a multitude of green bodies called chloroplasts in the cells. These chloroplasts stop some of the light rays and probably turn them into some form of electrical energy. When it is known that plants get their energy from sunlight, it is easy to understand why all green plants must have light and also why plants without chlorophyll, as the green coloring matter is called, cannot form food even in the light. Fungi and the colorless flowering plants have to depend upon food already formed and must live on other plant or animal parts, living or dead. They can also grow as well in darkness as in light.

The question of the harmfulness of plants in the sickroom is also connected with this subject. When daylight ends, photosynthesis ceases and with it the exhaling of oxygen. The carbon-dioxide given off in breathing, however, continues, though in such small amounts that it requires a rather carefully conducted experiment to detect it. Under these circumstances a whole roomful of plants would not use up as much oxygen

in a night as would a single lamp. We must remember, too, as regards the general effect of plants on the health, that invalids are often sent to the country to recuperate where there is little else but plants. When it comes to *flowers* in the sick-room, however, that it quite another story. Flowers often give off odors that are harmful even to persons in good health but this is not a result of breathing or of the formation of plant food.

THE EVOLUTION OF HERBS

THE origin of our plants has always been an attractive subject for speculation by the evolutionist. As data accumlate, it becomes increasingly evident that the first plants were evergreen, perennial, and, so far as land plants are concerned, tree-like in form. Herbs seem to have been a later response of vegetation to increasing cold and drouth which they encountered in less favorable parts of the earth. Such forms, however, enabled vegetation to exist in regions where other forms could not grow. In practically every instance, where plant families contain both herbs and trees, the woody forms have been shown to be earlier and more primitive. The cycads, the pines, spruces and other cone-bearers from which modern flowering plants appear to have descended, are all woody plants and appear always to have been so. Even the simpler flowering plants, such as the catkin-bearing Amentiferae and the relatives of the butter-cup family are nearly all tree-like in form. If the inference is correct that herbs are due to cold and drouth, we would naturally expect the plants of cold regions to be largely herbs, and this turns out to be the case. As regards the effect of this herbaceous vegetation on the development of modern forms of life on our planet, the following from "The Evolution of Herbs," by Dr. Edmund W. Sinnott in *Science* is pertinent.

The great advantages conferred by the possession of an herbaceous habit of growth in a region subject to low winter temperatures are obvious, for such plants are able to complete their cycles and to mature seeds in the warm summer months and they can then survive the cold of winter in the form of resistent seeds or by hibernating in the ground. Only the hardier types can maintain permanent aerial stems under these conditions. The more delicate woody families have either been exterminated outright in temperate regions or have survived only by assuming an herbaceous habit and thus flourishing in that part of the year which is free from frost. As might be expected if low temperature has indeed been the determining factor in the development of herbs, most of those families which are well able to survive cold as trees or shrubs and which form the bulk of the woody vegetation of the north temperate zone—the willows, birchs, oaks, beeches, walnuts, hickories, wax myrtles, elms, hollies, maples, heaths, buckthorns, lindens, planes, sumachs, cornels, and viburnums—are families which are almost entirely without herbaceous members. Being hardy, they have not been forced to adopt the herbaceous habit.

As to the details of this change in growth habit, we cannot, of course, be sure, but in those forms which it did not kill outright, the increasing cold probably effected a gradual reduction in size and an attendant shortening of the time necessary to reach maturity until very dwarf forms were produced which were able to develop from seed to seed in a year or two, and which could be killed back to the ground every winter—in short, perennial herbs. The herbaceous vegetation in Arctic and alpine regions today, is still composed almost entirely of such plants. The annual herbs, seem to have developed from this primitive type under more favorable environment, where a plant growing from seed, and thus without a subterranean food reservoir to give it a rapid start, could become large enough in a single season to reproduce itself.

The northern vegetation thus developed, proved extremely hardy and aggressive, and was able not only to overspread the great continental area of the north temperate zone, but to invade as well, the tropics and even the antipodes. The presence of a large number of typically northern genera of plants in Australasia, southern South America and South Africa, often separated from their related forms by the whole width of the tropics, has long been recognized as one of the most fascinating problems of plant distribution. It is important to note, that this invasion of northern plants (nearly 200 genera are known) which has been so successful in penetrating far southern regions and which display so well the "wonderful aggressive and colonizing power of the Scandinavian flora" to which Wallace and others have called attention, has in reality been an invasion of *herbs*, for almost none of the northern trees and shrubs have participated in it.

Herbaceous plants have also been developed in the south temperate zone, apparently in response to the refrigeration of climate there in the late Tertiary. Antarctic herbs were doubtless among the very last plants to leave the polar continent as the glaciers advanced. They are still almost all alpine or cold-loving perennials, and have as yet failed to give rise to the aggressive lowland annual type.

Refrigeration of climate was doubtless not the only factor in the development of an herbaceous vegetation. A large body of such plants seem to have originated in the arid regions, where they spring up rapidly and produce seeds during the rainy season, thus bearing precisely the same relation to extremes of moisture that arctic and alpine herbs do to extremes of temperature. The assumption of a rapidly climbing habit, especially in the tropics, has also resulted in the development of an herbaceous type of stem in such families as the melons, milkweeds, and passion flowers.

But whatever the cause of their origin, herbs have proved themselves an exceedingly versatile and aggressive type of vegetation under almost all climatic conditions. The reasons for this dominence are not far to seek. They are able not only to thrive in cold and arid regions but, from the brevity of their life cycle, can take advantage of temporarily favorable conditions of any sort. Their evident and great superiority over woody plants in rapidity of dispersal and ability to invade new areas quickly is due in large measure to the fact that their interval from seed to seed, instead of being many years, is only a few months. Every seed may itself become a center of dispersal in a season's time. The amount of seed produced, too, in proportion to the bulk of the plant body which has to be developed is far greater among herbs than among woody forms. Owing to the rapid multiplication of their generations, herbs are capable of more rapid evolutionary change than are trees or shrubs, and hence are able to adjust themselves more rapidly to new conditions. With these various advantages, it is not surprising that the herbaceous habit today characterizes not only great numbers of the commonest and most dominant native plant species in all parts of the world, but also that huge array of hardy and ubiquitous plants which we know as weeds.

This radical change in the growth habit of many plants from the woody to an herbaceous type which has taken place for the most part since the beginning of Tertiary time has not failed to exert an important influence on animal life. It may well be connected with the rapid evolution of mammals which we know to have occurred after the early Tertiary. To quote from Chamberlain and Salisbury:

The earliest Eocene mammals were much more primitive and obscurely differentiated that even those of the middle Eocene, and this rapid backward convergence seems to point to some set of conditions which caused an exceptionally rapid development of the great class at this stage, whatever their previous history had been. The coming into a new domain of

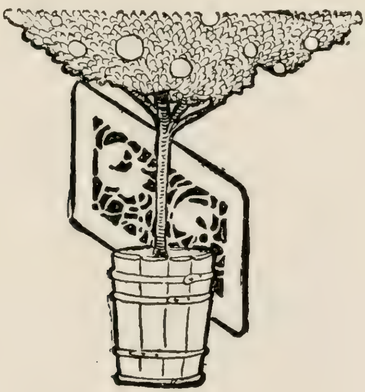
rich and varied conditions, whether by immigration or indigenous development, may be safely included among those conditions.

Is it not reasonable to suppose that the appearance of a great body of herbaceous vegetation just at this time was one of these conditions? This would affect directly the development of all herbivorous types and indirectly of many others. In the evolution of the tooth of the herbivora, indeed, we can trace the change from a sharply cusped type suitable for chewing tough leaves and twigs to the modern flat condition which is capable of dealing only with the softer herbaceous tissues.

Far more important, however, is the part which the herb has played in the development of human civilization. Primitive man seems to have been mainly arboreal in his habits, or at least primarily a forest dweller, and the wood, bark, and fruit of trees and shrubs were of supreme importance to him as sources of shelter, fuel, implements, clothing and food. One of his first steps from this barbarism toward civilization was to enter the open and begin the practice of agriculture. Those plants which most commended themselves to the earliest tillers of the soil were probably not the slow-growing trees and shrubs, but rather the herbs, since the rapidity with which they grow and reach maturity makes possible their culture even among such roving tribes as were our North American Indians. Only as man acquired a settled place of abode and a more permanent form of society could he begin the culture of woody plants in orchard and vineyard; and it is only in very recent times that agriculture has extended beyond these fruit bearing trees and shrubs and, in the form of forestry, has begun to treat the timber trees, themselves, as a crop to be cultivated.

The marked superiority of the herb in ease of agricultural manipulation, together with the wide variety of uses of root, stem, leaf, and fruit, have given it an increasingly high place

in man's favor. To be sure, trees and shrubs provide us with timber, fuel, paper, rubber, fruit, nuts, coffee, tea, cocoa, vineyard products, turpentine and many drugs and items of lesser consequence. Among herbaceous produces, however, are found all the cereals and vegetables, together with sugar, tobacco, most of the fibers, certain of the fruits and many other valuable commodities. In addition to all this, the animal industries, which are the sources of milk, meat, leather, and wool, are dependent upon herbs. The dominance of such plants in agriculture is shown by the fact that in the United States they contribute 96% of the value of the products of this fundamental industry. Without herbs, the feeding and clothing of our great populations today would be quite impossible, and though it is conceivable that with the advance of science civilized man might possibly dispense with woody plants, in the absence of herbs he would perforce revert almost to savagery again. Human society is an herbaceous product.



BULBS ON STALKS

By Willard N. Clute.

According to the dictionary, a bulb is a short thick stem. When Nature decides on a new form, however, she does not consult the lexicographers and in consequence we often get specimens that do not conform to the definitions. In the present instance, the curious elongated objects shown are really bulbs, for they occurred among hundreds of the conventional type, but they are so much like chubby sprouts, that at first glance they seem to be quite unrelated to the usual form. When planted, these stalked bulbs become normal plants of the wild hyacinth (*Camassia esculenta*), and if given room they will form rounded bulbs like those of the onion. When the regular bulbs are allowed to grow in one place long enough to produce one or two generations of bulblets, the crowding that

results produces these curious forms. Many of the bulblets become short fat little bulbs, but those nearest to the mother bulb grow up around it as if trying to make sure of a good start in spring. They are closely pressed against the parent bulb, and in most cases one can discern the curve in the side of the stem where the bulblet came in contact with its parent. Some of these stalked bulbs are three or four inches long, though not much thicker than a pencil.

THE WILD FLOWERS OF HAWAII

By Vaughan Mac Caughey.

(Concluded)

The genus *Scaevola,* with eight species, is abundant, and ranges from the sea-shores to the upper limits of the rain forest. The natives call it *nau-paka,* and tell a pretty legend concerning the split corolla of the flower, this being attributed to the angry fingers of a certain fair maiden who had quarreled with her lover. So every *nau-paka* blossom appears to have been torn. The corollas are beautifully pubescent within; in color white or bluish, with fine purple streaks. The one exception is *S. glabra,* with deep-yellow curved tubular corollas, nearly two inches long. The Scaevolas are shrubs or small trees, with alternate simple foliage and conspicuous flowers solitary or in axillary cymes. Like many of our Hawaiian shrubs, they flower continuously, and brighten many a valley slope and sea-shore with their tattered blooms.

Two large genera of Hawaiian composites are *Lipochaeta* and *Coreopsis,* each with a dozen species. These are all herbaceous perennials or woody shrubs; many are decumbent or prostrate. They occupy a wide variety of habitats, from arid to humid, and from sea-shore to the summits. The floral

heads are yellow, and form conspicuous masses of golden bloom. The bright patches of yellow that adorn the dripping mountain trails and ledges, and that soften the harshness of the dry rocky coastal regions, are generally one of these species. There are also a dozen native *Raillardias,* mostly high-mountain shrubs and trees, which are covered with yellow flowers during their blooming seasons.

Hawaii's most famous plant is undoubtedly the silver sword (*Argyroziphium Sandwicense*). The name refers to the basal cluster of closely packed, long, curved, dagger-shaped leaves, which are densely covered with beautiful lustrous silvery-white appressed hairs. The Hawaiians call this plant *ahina-hina,* which means silvery gray. This remarkable plant is confined to xerophytic habitats on the high mountains of Maui and Hawaii. At flowering time the stem elongates into a showy foliose raceme four to eight feet high, with a profusion of large floral heads. The disks are yellow, the rays are dark rose-purple. The spectacular beauty of this plant, both in its vegetative condition, and when in full flower, is a frequent theme for eulogy in the tourist literature of Hawaii.

The great volcanic mountain of Hale-a-ka-la, home of the Silver Sword, is girdled at an elevation of two to three thousand feet above the sea with a dense belt of a bright flowered endemic mint, the *pahaka* (*Sphacele hastata*). This is a herbaceous perennial of three to five feet in height, covered with sticky tomentum, and emitting a heavy menthene odor. The hastate leaves are six to nine inches long by two to four inches broad, and are thick papery in texture. The flowers are clustered in showy terminal panicles. The purple red corolla is an inch long, scarcely bilabiate. The strong odor and conspicuous blossoms of the *pahaka* are familiar to all who have tramped over the dreary and rugged waste-lands of Hale-a-ka-la's leeward slopes.

We have a number of indigenous geraniums, seven in all, chiefly shrubby perennials, and largely confined to the high mountains of Maui and Hawaii. The flowers are white and not especially noticeable. One species, *G. arboreum,* often developes a trunk of three to four inches in diameter. Its flowers are dull red, in cymes on short lateral shoots.

Our two buttercups, *Ranunculus Mauiensis* and *R. Hawaiiensis,* are both perennial, the former a spreading shrub, the latter erect and two to four feet high. Both are upland forms; *Mauiensis* occurs on all the islands above two thousand feet elevation; *Hawaiiensis* is confined to East Maui and Hawaii, above four thousand feet elevation. Both have bright yellow flowers; those of *Mauiensis* are small and in diffuse open panicles; those of *Hawaiiensis* are larger and showier, and massed in closed corymbs. The basal leaves of each are on petioles a foot long, and have dissected blades from four to six inches in diameter. In the tropics the Ranunculus group is largely restricted to the higher mountains, and our Hawaiian species exemplify this rule.

Two endemic labiate genera that are widely scattered through the woodlands and mountains are *Phyllostegia,* with about sixteen species, and *Stenogyne,* with about eighteen. The number of species is approximate, as there is much variation, and numerous forms are weakly defined. They are all branching undershrubs, some prostrate, others decumbent, and others erect and trailing over the surrounding vegetation. The flowers are small and clustered in axillary and terminal racemes and panicles. The *Phyllostegias* have white flowers, often suffused with purplish or pinkish; those of the *Stenogynes* are either greenish yellow or purplish red. These plants grow chiefly in the higher levels of the rain forest, and illumine many of the dark and otherwise gloomy ravines with their pleasant color masses.

There are half-a-dozen *Lysimachias,* of which all but one have large conspicuous purplish flowers. These grow singly in the axils. The plants are low or tall shrubs, varying in stature from one to eight feet. *L. spathulata,* with greenish-yellow flowers, grows along the sea-shore; the others are characteristic of the valleys, ravines, ridges, and bogs of the rain forest zone, and ascend to an elevation of five thousand feet. *L. daphnoides,* the *kolo-kolo kua-hiwi,* "mountain creeper" of the natives, is one of the beautiful-flowered plants of the famous summit swamps of Mount Wai-ale-ale of Kauai. The purple blue flowers are large and fragrant, and stand out showily among the thick, leathery, dark-green leaves.

A distinctively Hawaiian flower of rare charm is the native begonia, *Hillebrandia Sandwicensis.* The genus is endemic; there is but the single species, and the natives call it *pua-maka-nui,* the big-eyed flower. Few people, either natives or whites, have seen this lovely plant, as it grows only in deep shady ravines and glens in the rain forest, and on the almost inaccessible faces of exposed rainy precipices. The succulent stems rise from a tuberous rhizome to a height of two to five feet. The leaves are borne on petioles of two to six inches; the leaf blade is four to eight inches in diameter, and irregularly five to nine lobed. The many-flowered corymb arises from the axil of the uppermost leaf, and is four to eight inches long, bearing a profusion of brilliant pink or rose colored flowers. The plant as a whole is very attractive and shows real horticultural merit.

The Hawaiian *Gardenias* are noteworthy among the beautiful wild flowers of the archipelago. Both of the two endemic species, *Brighamia* and *Remyi,* have an abundance of large, fragrant white flowers. Brigham's gardenia is a shrub of six to twelve feet, with shining dark-green leaves. It inhabits arid leeward slopes and ridges. Remy's gardenia is rare, and occurs scatteringly in moister habitats than the other. It is a

tree of thirty or forty feet. The young shoots copiously produce a glutinous exudation which covers the leaves as with a layer of shellac. In both species the lovely, heavily-scented flowers are terminal and solitary.

Undoubtedly the crowning glories of Hawaii's floral world are her unique woody *Lobelias*, of which there are *nearly one hundred species!* Of the six genera, five are endemic, and practically all of the species are endemic. The corollas of these highly specialized and interesting plants are long, curved, tubular, and deeply slit along the back. In one remarkable monotypic genus, *Brighamia,* the corolla is salvar-shaped, with a straight, entire tube three to five inches long. In color the lobelia flowers are greenish white, cream, pale pink to deep rose, lilac, purple, or dark bluish. The lighter ones are often marked with darker stripes. Some of the inflorescences attain great size, spreading out several feet from the stem, and laden with flowers in various stages of development. Many of our Hawaiian Lobelioideae are trees, ten to thirty feet in height, with naked stems closely marked with leaf-scars, branching sparingly, and the foliage crowded at the ends of the thick branches. The lobelias occupy a wide variety of habitats and elevations, but are largely restricted to the humid forests, exposed rainy slopes and precipices, and other distinctively hydrophytic regions. Many species are highly precinctive. The range of variation and polymorphism is phenomenal. Many forms are on the verge of extinction, or are already extinct. The apparent over-specialization of the floral structures strikingly reminds one of similar conditions among certain orchid genera. Like many other elements in the Hawaiian flora and fauna, the lobelias seem to be the vestiges of a much more extensive primitive flora.

A DAY AND NIGHT ON MOUNT ADAMS

By Walter Albion Squires.

TO the nature student a glacier-clad mountain is a source of never-failing interest and inspiration. Whether he sees it catching the first tints of the coming day, or lighted by the sunset glow, or lying cold and still under the midnight stars, it has for him a call and a challenge. For some three months I had been living in the little village of Troutlake, Washington, and almost at the foot of Mount Adams. I had felt the call of the mountain almost every day. The sight of it gave me the climbing fever. I longed to see what Nature had wrought up there among the crags, snowfields, and glaciers. At last the time came when I was free to attempt the scaling of the vast and rugged old volcanic cone. Guides and riding animals were to be had, but I chose to go alone. I knew from former experiences that Nature yields her best to us when we are unhindered by human companionship. As for riding horses and pack animals that stray away at night and lead you a weary chase ere they are recovered, I wanted none

of them. With a good pack sack a man can carry forty or fifty pounds with comfort and be independent.

I made an early start. At half past two in the morning I was off, down the silent streets of the little sleeping hamlet. I crossed the White Salmon River on the boom dam of the lumbermen. Beneath me the murmuring waters glinted in the starlight. It was quite dark under the tall pines and firs; they shut out the light from the stars, and starlight does not do so bad when we cannot get any other light. I could not see the trail but I knew its general direction, having been over that part of it before, and one soon gets in the way of keeping the trail with his feet, when his eyes can no longer serve him. The trail through a forest is firm to the tread, but a step off of it puts one on the soft carpet of the forest debris. Wild things screeched weirdly now and then off in the dark woods, and occasionally something would go pattering off over the fallen leaves. I knew what made the pattering; it was the Neotoma or wood rat, a mild-eyed and harmless night-prowler in the forests of the West. I did not know what sort of creature was doing the screeching but I encouraged myself with the thought that, taken all in all, the forest is far safer than the city.

I had planned to be on the highlands near timberline by daybreak and I was there on time. Daybreak at timberline is an experience never to be forgotten. While all the lowlands were yet in deep shadows, the great snow-clad cones of the ancient volcanoes, which dot the northwestern part of our country, began to stand out against the sky clothed in rosy light. In the south, Mount Hood rose into the sky with its sharp spear point of snowy granite. Farther away Mount Jefferson could be seen. In the west Mount St. Helen's symmetrical cone was all aglow with the first-born sunbeams of the new day. As it grew lighter, I began to notice the flowers. It is not my purpose to give a list of all the flowers I found on the trip; I shall mention only a few which were especially inter-

esting to me. The most conspicuous plant of these timberline areas is a tall liliaceous plant (*Xerophyllum tenax*). It grows three or four feet high and consists of a bunch of rough grass-like leaves from the midst of which springs the slender flower spike. Somewhere on this spike is a puff of snow-white blossoms as large as your two fists. Above the ball of bloom are the undeveloped flower blossoms, and below it are the ripening seed pods and withered corollas. It blooms for several weeks, the blossoming beginning at the bottom of the spike and climbing up until it ends at the summit.

On a grassy slope, fresh and green as a Kansas prairie in May, I came upon some *Calochorti*—Mariposa tulips, they call them in California; only these were of a kind I have never seen in the Golden State. An examination of the flowers showed them to be *Calochortus Lyalli*. This flower is very much like the *Calochortus* called in Utah the "Sego Lily" and the state flower of that commonwealth. A little farther on were many bright yellow *Erythroniums*. I suppose they were *Erythronium grandiflorum* though they did not look quite like the flowers of that species I had been familiar with in Northern Idaho. Not far from the *Erythroniums* I came to my first snow. It was a field some acres in extent, much discolored and soft from the sunbeams which were beating down upon it with almost tropic heat. Several kinds of plants grew almost up to the very edge of the melting snowfield. The little one-flowered *Dicentra,* and the alpine phlox were the most abundant of these flowers crowding upon the edges of the snow.

I crossed that snowfield and several others and made camp beside a little icy stream that burst noisily out from underneath a large field of snow. Back of this snowfield was what I at first though was a very steep and rocky cliff. I afterward found that it was not a cliff at all, but the terminal moraine of a tremendous glacier which swept down from the very crest of the

great mountain. As I was resting for a moment after having eaten a hastily prepared breakfast, some of the rocks up near the summit of the moraine broke loose and came thundering down, plunging out of sight in the heaped-up snow at the foot of the moraine cliff. That was a cliff of rock in motion; pressed by the millions of tons of ice behind, it was moving down the mountain side and I was right in its path. There was no need for alarm, however, it was probably moving no faster than a few feet in a century; there was plenty of time to get out of its way.

Near my camping place I found a little flower which I had long wished to see. I had often read of it in the writings of John Muir; *Cassiope Mertensiana,* the books call it. John Muir always called it cassiope, and if you have ever seen the picture of Muir and Roosevelt taken on Glacier Point, Yosemite, you have seen a sprig of this same plant in the buttonhole of Muir—great-souled man of the out-of-doors—he loved it as Linnaeus loved the twin flower!

After breakfast I started to climb the rocky ridge to the east of my camp. I intended to spy out a route to the summit so as to be ready to attempt the ascent the following morning. I found that this ridge lay between the glacier, at the foot of which was my camp, and another glacier equally large which swept down the southeastern side of the mountain. Between these two glaciers the ridge I was on ran like a great Cyclopian stair apparently right up to the summit. Carried away with that exhilerating motion which makes it hard to turn back when one has set his face toward the heights of a great mountain, I climbed on and on. I had not intended to attempt the ascent that day, but finally changed my plans and made up my mind to go to the top if possible. I supposed I was far above all vegetation, other than the gray lichens on the stones, for on each side of me a few feet away were the everlasting snows. I was surprised, therefore, after a time to notice down among

the huge blocks of broken lava, where a little soil gave them a precarious foothold, were some tiny blossoming plants. They proved to be plants of the mustard family, *Arabis Suksdorfii.* No other species was found growing at such an elevation. It must have been all of ten thousand feet above the sea.

These high altitudes were not quite destitute of animal life either. An American pipit flew out from among the broken lava blocks and went skimming away across the snow. Hardy little mountaineer, it must love the craggy peaks, for it makes twice a year a journey of more than a thousand miles for the sake of spending ten weeks on these icy summits!

Perhaps we need not wonder at it, for birds are home-lovers, and a bird's home is where it builds its nest. Butterflies went by on the wing occasionally. I don't know what they were doing away up there on top of Mount Adams, but they were there. I also saw a good many spiders laying in the snow stiff with cold. How did they get there? I do not know, unless it be that they were taking a journey across the world in those cob-web flying machines of theirs and met disaster by being blown upon these snowy slopes above the clouds.

I found that my Cyclopian stair did not reach the top of the mountain as I had supposed. It ended in a steep snow slope. I had a desperate climb before I stood on the highest point of that old mountain, but I reached it at last. I was twelve thousand one hundred eighty-four feet above the sea. Mount Adams is unlike the other volcanic peaks which arise around it. They are cone-shaped, Adams is a great knife-edged ridge. It slopes up gradually on the north side and on the south side, but on the east and west it falls off in awful perpendicular declivities. From the summit Mount Ranier, hidden before, came into view.

Far away in the north, near the Canadian line, the triple peaks of Mount Baker arose on the horizon. I looked down

on miles and miles of forest, even-topped as a field of wheat. Off in the southwest the Wilamette Valley lay buried in clouds. On the east the plains stretched away in a yellow haze of wheat fields, for it was harvest time.

The wind cut through me and my fingers were so numb that I could hardly write my name in the book kept in an iron box on the summit.

The sun was now nearly down and I knew I must hurry to reach camp before dark. The descent was much more easy than the upward climb had been and I reached camp just at dusk. There were not many trees near me, that is trees that were living ones; but not far away was a clump of dead white-barked pine. I gathered fuel from these and started a fire. It was most excellent fuel, burning with a steady flame and dying down into a great heap of glowing embers that lasted a long time. I had never before seen pine that made a fire like that. I suppose it may be due to the fact that the trees grow very slowly at these high altitudes.

What a night that was! I lay in my blankets and looked up into the universe of stars. How bright and steady they shone in that clear high atmosphere; beacon lights in the infinity of space—"street lamps in the city of God!" In the morning the little stream that came from the snowfield was silent. It was frozen solid. I had been up most of the night gathering fuel for the fire, if it had not been for the fire I believe I should have frozen to death.

I reached home that same evening tired and footsore, but feeling that the time had not been wasted, for I had become better acquainted with the great mountain, and perhaps, in some small way better acquainted with Him whose handiwork is the everlasting hills.

THE STARS OF AUTUMN

NO one, it seems, has ever called an aster anything but an aster. Aster is the name given by the pedants, it is also the name used by the extreme unlearned. Spectacled scientist and tousled peasant for once use the same language. An aster is an aster.

Away back when botanies were not thought of someone admired the purple and white delights of autumn and called them stars. Aster is the Greek word for star. No one ever improved on this designation. They are the earth stars of autumn. They are the year's last floral fulfillment. They are the completion of the cycle; solid, substantial, self-reliant; yet wonderfully beautiful. Only the freakish witchhazel waits to bloom after the asters.

So common are the earth stars that they fail to command adequate attention. Every wild roadside is alive with them. Every pasture displays them, every woodland, every brook vale, every waste desolation of suburban metallic garbage. At home in the most entrancing dell of the remote ravine lands and equally at home where the tin cans fester and rust in shameful heaps they mark the year's last effort to beautify the world. The goldenrod is their lesser helper; for the goldenrod is more easily discouraged and her satisfied hue carries no message of forward-looking cheer comparable to the azure hopefulness of the asters.

Of asters there is an abounding variety. Commonly they are classed as purple or white; but this is absurdly superficial. Purple is no proper classification of the many shades of tinged

blue which the frost-nipped fields and woods display. And even the less attractive white kinds are of many varieties. The weediest of all the cheeky, shrubby species that advance even to the ugly hedgerows of civilization and make them less ugly are worthy of admiration and respect.

Incomparably the most beautiful of the aster tribe is the misnamed New England aster, which is common outside of New England, but rather rare in New England. This is the queen of the autumn gypsies of Flora's world. She is most at home where she can queen it from some quiet brook bank, bending over the ripple, or haughtily receding to the sunny slopes. Hers is a regal purple far more magnificent than any the other species can show, and by some perversion of compensation her flower head is much larger and showier than that of any other aster. She is the one aster that irresistibly demands separation and classification. Of the others there is little obvious distinction; the botanists may note the heart-leaved, arrow-leaved, prenanthoides, and dozens of others, but to the man in the fields they are all mere asters. The New England monarch is strikingly different; so different, in fact, that it is almost difficult to class her as an aster at all.

Unadvisedly at times *Novae Angliae* consents to grow by the roadsides. She is not frequently foolish enough thus to display her allurements. It is almost a certainty that her blossoms will be plucked in armfuls wherever they are seen for she is not only the queen of the autumn but a regal personage among all the flowers of the year. With wisdom, therefore, she usually seeks the hidden brook nooks, where she majestically rears herself higher than a man's height and displays her splendor without fear of ravishment. While her smaller cousins and courtiers range the roadside in dense masses, confident that their lesser and excessively common charm will assure their immunity.

It is well to go star gazing in autumn and to gaze downward for earth stars. All the stars are not in the vaulted firmament. We are, ourselves, earth creatures and the earth stars are more comprehensible than the stars of the sky with their sense-dulling distances and magnitudes. But their message is the same, the message of life and wonder. Without wonder life would be little.—*Cleveland Plaindealer.*

TRAINING IN HORTICULTURE

I THINK that the college bogy has been held up too much. I don't believe that a college course at all fits a man for assuming charge of even a small estate. The drawbacks in our agricultural colleges today are, that really practical men are to a large degree lacking. I do not mean to infer that the professors are not bright, intelligent men; but how many of them have had any great degree of practical horticultural training? When our colleges select men who are first class *growers* to have charge of their greenhouses and grounds, men who will be free from petty interferances from the more purely theoretical teachers then they will turn out young men who can with greater confidence apply for positions where practical worth is needed. Even then I doubt if such men would be competent to take charge of any position before spending a year or two on some private estate.

Then we have or may have, competition from another source. I refer now to the so-called landscape gardeners, or architects, as some prefer to call themselves. To some of these, men on a high plane, with a national reputation we would all be ready to doff our hats; but there are now a vertiable flood of these embryo landscape gardeners, female as well as male, being turned loose on suffering humanity. I do not refer for a moment to the jobbing gardener or florist who has the magic

words "landscape gardener" printed on his letterheads, but to the more cultured product of Amherst, Technology, and Harvard.

I have abundant opportunities to see and study these rising, active, and intelligent young men. They are being turned out in such numbers that I wonder what must become of them all. Now I have noticed that nearly all these youths and their teachers can talk pleasingly on landscape designs, but that, so far as practical *gardening* is concerned, they know very little indeed. Yet these men are intruding themselves upon those who have forgotten more of horticulture than these new fledged landscape artists know, and in not a few cases are allowed to draw plans, make changes, and suggest, or even superintend, plantings for which they are grossly unfitted. I think I am safe in saying that not one landscape gardener, architect or artist—choose whatever term you like best—in ten, is competent to draw up plans, suggest proper plantings and see such carried out.—*From an article by W. N. Craig in Gardener's Chronicle.*

MIRACULOUS WHEATS

THE notion that there is a wonderful wheat which will make the fortune of anyone who plants it seems to be almost as old as agriculture itself. In this country, at least, such an assertion was made for the so-called Jerusalem wheat as early as 1807, and, under the name of Alaska wheat, this identical variety is still being pushed upon the unwary at exorbitant prices for seed. Almost equally exaggerated claims are made for the Stoner variety, but this particular wheat has not such a long history.

Because of the many attempts that have been made by promoters to foist these wheats, under one name or another,

upon the farmers of the country, the United States Department of Agriculture has made careful tests of their value. In Bulletin 357 of the department the results of these tests are said to show conclusively that neither of the wheats possesses any peculiar quality which justifies high prices for the seed. Many varieties grown commercially throughout the country have, in fact, proved to be somewhat superior to either the Alaska or the Stoner.

These facts, however, have not prevented the promoters at various times from asserting that yields of from 100 to 222½ bushels per acre can be obtained from this wheat. In particular, they have urged it as a valuable variety for the worn-out farms of the East because with such yields farmers can afford to use fertilizers. According to one circular the wheat flourishes in dry countries because its native home, Alaska, is dry; in cold countries, possibly for the same reason; and in hot countries, for some reason not stated.

A favorite story with promoters is to the effect that when the coffin of an Egyptian mummy 3,000 or 4,000 years old was opened some wheat was found in it. The seed was planted, but only a single kernel grew. This, however, was a wonderful yielder and very different from any other wheat known. This story is responsible for such names as "Mummy," wheat 3,000 years old, "Egyptian," and "Miracle." It is, of course, an absurdity, for even under the most favorable conditions seeds of wheat do not keep their vitality more than a few years.

In 1908 this wheat was brought forward again, this time not as a product of Egypt, but of Alaska. It was asserted that an Idaho farmer had found in a secluded spot of the Alaskan coast a wheat plant with a branched head. He had brought back one head, sowed its seed that fall (in 1904), obtained 7 pounds to sow in 1905, and by 1906 had 1,545 pounds, an increase of two hundred and twenty fold. From this it was

argued that 1 bushel of seed per acre would produce 220 bushels. A seed grain company had obtained the seed from the farmer and would dispense it at the rate of $20 a bushel.

Upon investigation the United States Department of Agriculture found that about 700 acres of the wheat were being grown for the company in Idaho. The average yield per acre was estimated, not at 220 bushels but at 25 bushels. Upon identical conditions well-known wheat varieties of the Pacific Northwest were yielding fully as much or more and good farmers in the neighborhood were not growing the wonderful wheat.

This investigation was followed by a warning notice from the department and also by a fraud order from the Post Office Department against the advertising material circulated by the company. In spite of this fact, however, another campaign was begun in 1909 and in 1915 the wheat was actually placed on exhibition at the Panama Pacific Exposition. Last year, also, the same wheat was offered for sale at $7 a bushel under the name of Egyptian 7-headed wheat. At other times this wheat has been sold as Eldorado, Many-Headed, Many-Spiked, Multiple-Headed, Reed, Smyrna, Syrian, and Wild Goose.

NOTE *and* COMMENT

PAINTED SNOW FLOWER.—It is remarkable that a plant of such singular beauty as the painted snow flower (*Spraguea Umbellata*) has so long escaped cultivation, especially when it is so easily grown, from seeds and when the roots are easily transplanted. When the winter snows of the upper Sierras commence melting, the bright green leaves of the spraguea appear, and in June it is at the height of its flowering season. Along the rocky wind swept plateaus and mountain meadows the ground is carpeted for miles with this lovely flower. The plant is low and prostrate in habit and sends up from two to five flower stems varying in height from five to eight inches. The top is surmounted with a snow white cottony ball of flowers, which are spotted with the brightest shades of delicate pink, rendering the flower one of great beauty. Its blooming period is from three to five weeks.—*S. L. Watkins.*

FOUR-LEAVED MILKWEED.—Gray says the range of the four-leaved milkweed (*Asclepias quadrifolia*) extends from North Carolina north and Chapman says it is native to the mountains of Georgia and North Carolina. I am sure its range is more extensive. I have seen it in Louisiana, Alabama and Mississippi. A prolific seed-bearer and cultivated in the gardens of New Orleans and other cities, the plant very probably has spread far and wide from self-sown seeds. It loves the shade and in its native haunts is found in woods and thickets. Under cultivation the plant grows about eighteen inches high, bearing umbels of delicate pink blossoms from

June till August. When the seeds ripen and the pods open the plant is unique and beautiful. The seeds cling to fine silky white threads and are then blown hither and yon. The common name of this pretty plant is silkweed. Seen in the woods or in city gardens, it is much admired.—*Mrs. Georgia Torrey Drennan.*

EARLY PLANT COLLECTORS.—Every age, it seems, has had its quota of objectors to the methods of those who gave names to the plants. A century ago, Schleiden, who with his friend Schwann gave the cell theory to the world wrote as follows: "Most people of the world, even the most enlightened, are still in the habit of regarding the botanist as a dealer in barbarous Latin names, as a man who gathers flowers, names them, dries them, wraps them in paper, and all of whose wisdom consists in determining and classifying this hay which he has collected with such great pains." This certainly has a familiar sound. One is inclined to wonder if another century hence there will still be room for such complaints.

COLCHICUM AND CROCUS.—Just as the first leaves begin to drift down from the trees in autumn, there spring up, in the gardens of the knowing ones, a host of crocus like blossoms that continue to appear for a month or more. These are blossoms of various species of *Crocus* and *Colchicum*, all of which pass under the general name of autumn crocuses. One would never imagine from a reading of American catalogues that there are a large number of crocuses that bloom in autumn but the fact is, that possibly half of the species in this large genus have this habit. Many kinds are cultivated on the other side of the Atlantic and the practice may well be taken up here. When once planted the species may be depended on to improve for years. They may be had in various hues of white, yellow, blue, and purple and must be planted very early in autumn if one would have blooms the first year. Very similar to the crocuses and blooming at the same time, are the various species

of *Colchicum*. One species is offered by American dealers as the autumn crocus (*Colchicum autumnale*), but the plant is not a crocus. It is probably out of the question to expect people who deal in such bulbs to have any very clear idea of their botanical relationships, but the botanist should have more discrimination. As a matter of fact crocuses and colchicums belong to two entirely different families of plants. The crocuses are members of the Iridaceae and therefore have only three stamens and the ovary is inferior. Colchicums ,on the other hand, have six stamens and a superior ovary and therefore belong to the Liliaceae.

Berries of the Ranunculaceae.—Fleshy or juicy fruits are very irregularly distributed among the plant families. The Rosaceae, Solanaceae, and Ericaceae have an undue proportion of such fruits, while several of the tree groups lack them entirely and others have only an occasional specimen. It has recently been shown that practically all the juicy fruits are borne on woody plants. Here and there occur the exceptions that prove the rule, such as the strawberry, tomato, asparagus and lily-of-the-valley, but one soon gets to the end of this list. All the more surprising, therefore, is the occurrence of an herbaceous genus among the crowfoots (Ranunculaceae) which bear berries. The baneberries (*Actaea alba* and *A. rubra*) commonly known as the white and red cohosh, respectively, are said to be the only members of the Ranunculaceae in the world with this habit. The order Ranales, to which this family belongs, has many species with fleshy fruits, however, especially in such families as the Anonaceae, Menispermaceae, Berberidaceae, and Lauraceae.

Silver Thaw.—The rather poetic name of silver thaw has been given to a form of precipitation which ordinary mortals call rime or hoar frost. The word rime is reserved by the weather bureau for the feathery frost crystals that form on trees and other objects during a fog in winter. To be at their

best, these crystals must be formed when there is a slight movement of the air, being built up on the windward side of objects from the supplies of moisture constantly brought to them. The silver thaw happens when the air is filled with the silvery shimmering frost crystals formed high above the earth after a cold night in winter. A scientific classification of precipitation forms include the sweating of stones and walls, dew, mist, fog, rime, hoar frost, mist ice, rain, snow, hail and sleet, but the silver thaw is the most beautiful of all both in title and appearance.

Vernacular Names.—It is very probable that many of the vernacular names cited in our manuals are not now in use in the United States except as they are learned from the manuals themselves, that is, they are book names, and undoubtedly hundreds of vernacular names in more or less common use are unrecorded. Scores of "common names" have no existence except in print, being often a mere translation of the Latin names. How much better it would be to cite an actually used vernacular name, even if known only in a limited region, than to coin a name by the simple process of translating the Latin one and thus establishing in print a name that nobody ever uses. Yet probably no herbarium in the United States gives any appreciable amount of data as to vernacular names actually in use, for the simple reason that botanists and collectors have neglected to record such names with the specimens. —*E. D. Merrill, in Science.*

A New Form of Rudbeckia Hirta.—In an old upland pasture at Vaughns, north of Hudson Falls, New York, where the black-eyed Susan has been very abundant for several years, an interesting form was found July 28, 1916, which may be called *Rudbeckia hirta* f. *viridiflora.* It is like the type, except that the orange-yellow rays are partly or wholly green. The type is in my collection. In some of the flowers only the lower part of the ray was green, or green along the center of the ray:

but flowers with green rays were not rare. The green rays were about half the length of the yellow rays of the ordinary flower. A green flowered yellow daisy is a very noticeable plant; as plants producing conspicuous green flowers are rather unusual in our floras. This pasture is near where this western plant was introduced about 1856. Hundreds of typical plants were in bloom in this field. Among the plants, were found occasionally, flowers with a double row of orange-yellow rays.—*Stewart H. Burnham.*

Strength of Wood.—One of the earliest relations which foresters have established with a fair certainty is that between the specific gravity of wood and its technical qualities. Some foresters even go so far as to claim that the specific gravity of wood is an indicator of all other mechanical properties and that the strength of wood increases with the specific gravity irrespective of the species and genus. In other words the heavier the wood, all other conditions being equal, the greater its strength. Even oak, which apparently formed an exception, has been recently shown to follow the same law. If there is still some doubt that the specific gravity of wood can be made a criterion of all mechanical and technical properties of wood, the correlation between the specific gravity and the resistance to compression endwise (parallel to the grain) is apparently beyond question. The compression endwise equals 1,000 times the specific gravity minus 70. One of the other properties of wood, namely, hardness, was found to have a definite relation to the bending and compression strength of wood and this fact tempts to the conclusion that by hardness alone all other mechanical properties can be determined. Hardness was also found to have a definite relation to the proportion of the summerwood in the annual ring, and consequently to the specific gravity of the wood.—*Henry S. Graves in Journal of the Washington Academy of Sciences.*

Pink Mayapple Blossoms.—Like other white flowers, the may-apple or mandrake (*Podophylum peltatum*) occasionally produces a pink variety. The Garden Magazine recently recorded a form of this kind from Iowa which, in addition to being pink, is semi-double. It is interesting to note that at least one of the three other species of *Podophyllum*, all of which are natives of Asia, bears pink flowers regularly. This is *Podophyllum Emodi* from the Himalayas. It is offered for sale by several American nurserymen and is said to thrive in gardens if given a fairly moist and peaty soil.

An Edible Amaranth.—The amaranths are rarely regarded with much favor by the gardener. A large number are pernicious weeds with no beauty of flower or foliage and the occasional species that possesses some merit of this nature, like the cock's comb (*Celosia*), globe amaranth (*Gomphrena*), and prince's feather (*Amaranthus*) are beautiful only by comparison with their congeners. Nor has this family much better claims to usefulness. Its nearest relatives, the pigweeds or goosefoots (Chenopodiaceae), on the other hand, have many useful species incuding the beet, spinach, chard, orache, quinoa and several other edible or medicinal species. Until recently, the Amarantaceae has nothing to its credit in this line, but W. E. Safford has discovered that one species once held a position of much prominence and was high in kingly favor being in fact the plant whose seeds was exacted in tribute from the Aztecs by Montezuma, himself. More than 150,000 bushels are said to have been stored annually in the royal graneries. The plant producing these highly valued seeds is no other than a form of our well-known prince's feather (*Amaranthus paniculatus*). It is a native of Mexico and was originally brought to northern gardens as an ornamental plant but is now a common weed in waste and cultivated grounds. The seeds which are ivory white and smaller than a mustard seed were ground and mixed with syrup to form a paste or dough from which

images used in the religious ceremonies of the Aztecs were made. Similar plants are cultivated as grain crops in Thibet, India and Africa, and it has been suggested that this might be useful as a crop for parts of our Southwest. If it grows under cutivation as well as it does when every man's hand is against it, there should be no question regarding the success of the crop. It is likely, however, that as soon as it had a value it would develop a number of blights, rusts, and smuts like all the other pampered denizens of the garden.

Lilies with Bulblets.—Early in September, when I was weeding a hardy border in which are planted Madonna lilies, I found one withered stalk which was covered for several inches above the ground with tiny lily bulbs, twenty-seven in all. Some were as large as peas; others hardly larger than pin-heads. I planted them in a bulb pan and twenty-two have grown into thrifty little plants. I have never seen or heard of anything of the kind and would like to hear through the *American Botanist* if it is a common occurrence and how it is brought about.—*Adella Prescott, New Hartford, N. Y.* [This seems to be a unique performance of *Lilium candidum* but a similar production of bulbets is the regular thing in *Lilium tigrinum* and perhaps other species. The small bulblets produced among the scales of the bulb by practically all species of lily are of the same nature. Bulbs of all kinds are essentially buds. The usual form, such as is illustrated by lilies, tulips, onions, and hyacinths, become individual plants and, as in other plants, produce buds (bulbs) in the axils of the leaves. While it is usual to find these new bulblets in the axils of the bud-scales, it is not uncommon to find them on the flowering stalks of tulips and in some of the onions they occur among the flowers or occasionally entirely take their places. Again in the adder's-tongue (*Erythronium*) they form long and slender runners and in the amaryllis they often have the form of offsets. When bulbs occur in unusual places, as on the stalks without order in the

case reported by Miss Prescott, they are in the nature of adventitious buds. Many plants have the faculty of thus developing new buds from growing tissues. A number of ferns, begonias, house-leeks, the common sundew and various other plants may thus originate buds on their leaves, the leaves thus taking over esentially stem-like functions. If properly handled, such buds will become strong plants. In a number of lilies, the bud-scales, themselves, if kept warm and moist will develop buds and turn into bulbs, which, since the bulb-scales are really leaf parts is not surprising. The owner of a bulb which he wishes to hurry into multiplying will often injure the base in the expectation that new buds will develop on the cut surfaces.—Ed.]

Coca.—The plant from which the alkaloid, cocaine, is obtained, (*Erythroxylon coca*) belongs to the Linaceae or flax family and is a native of Peru and Bolivia. It is a shrub some six or eight feet high. The leaves have long formed an article of trade among the natives for which purpose the shrub is extensively cultivated. The leaves are used, either infused in tea or chewed with a small quantity of powdered lime which is carried on long journeys in a small gourd. It appears to have been generally used by miners or those making long journeys without the means of securing food, as it lessens the desire for food and produces a feeling of increased energy. An immense amount of fatigue can thus be undertaken combined with a pleasureable effect. When used in moderation it seems to act as a powerful stimulant but in excess it produces a kind of intoxication of the nature of opium and the consequence of its prolonged use is quite as injurious, so that the habitues among the natives seldom live long. Dr. Spruce, the well-known South American traveller and botanist says that the native with a "chew" of coca in his mouth will often go without food for two or three days without feeling any wish to sleep.—*Botanical Journal.*

EDITORIAL

With the ending of another volume and the consequent renewal of a large number of subscriptions, we would again call attention to our "Permanent" list. Though called permanent subscribers, those on this list are under no obligation to continue subscribing for any definite length of time. The term is used simply to distinguish those friends of the magazine who subscribe year after year and who therefore form a sort of company to ensure its success. Such subscribers expect the magazine to be sent them until it is ordered stopped and they pay during the year when most convenient. The price to such subscribers is seventy-five cents a year. Any subscriber may be transferred to the permanent list by sending us $1.50 for a two-year subscription and asking to be transferred. When the subscription expires it may be renewed at the reduced rate as long as desired. Those who like the magazine well enough to wish it to continue coming to them will save money by joining the permanent list.

* * *

The replies to our request for co-operation in settling various botanical questions has been very encouraging and we forsee an interesting future for this new kind of botanizing. A short time ago, the American Genetic Association thought it worth while to try to discover where the largest American trees of their kind were located and taking a hint from this, we may well begin operations by attempting to discover some facts of a similar nature regarding our wildflowers. Replies are there-

fore invited to the three following questions. What is the most fragrant native wildflower in your region? What is the most beautiful native wildflower taken singly? What is the most beautiful native flower in masses? It is quite likely that replies will vary somewhat, due in part to individual preference and in part to differences in the flora. One might suppose that in New England the trailing arbutus, the Azalea and the white water lily will vie with one another for first place, but in the prairie States where heaths are often rare, the award might go to the wild crab, the basswood, or even some of the phloxes. In the South the magnolia might be chosen. As for the Far West and Northwest, there are doubtless plenty of fragrant flowers there but none seem to have become famous enough on this account to have become conspicuous. The other two questions to which replies are invited are not different forms of the same question as may at first appear. It is quite possible for flowers small and insignificant, individually, to produce much beauty in the mass while single flowers though beautiful may not always be so in groups. It may require some thought to select the representative for each question. All who are interested in the subject are invited to send in replies. There are no dues, fees or other obligations connected with the scheme. All we want is such information as readers can give and this may be sent in on a postal if more convenient. The results of the first inquiry will be published in the next number of this magazine.

* * *

As this is written both the August and November numbers are in type but not printed and the copy for the first number of the new volume is ready. The unreasonable delay in the magazine is due entirely to our printers. This, however, is to be the last delay of the kind. If our present printers do not rapidly develop more ginger we purpose changing to some other firm that is not so lacking in this essential quality.

Say what you will about the old myths and fairy tales, they pale into insignificance alongside of the modern myths invented by the inspired but ignorant reporter. Here is a new one about the "Angry Tree" which one of our readers sends us. It seems to be built up on the reputation of the sensitive plant, except that the new myth concerns a much more sensitive and ill-tempered species than ever occurried in Nature. "Did you know that a tree can get angry? There is a kind of acacia in Nevada that not only is "touchy," but, as the gardener puts it, "goes very mad." It is about eight feet high, and is a very rapid grower. When the sun sets it is ready to go to sleep, shuts its leaves together and coils up its twigs just like a pig-tail. If anyone pulls that tail—well, the tree doesn't squeal, but it flutters and moves uneasily, and seems to be deeply agitated. If it is ever disturbed by a shock, such as transplanting, the leaves stand out in all directions and quiver violently. Strangest of all, they send out a pungent, nauseating odor, that is most unpleasant. It takes this bad-tempered tree an hour or two to get back into good humor." Isn't it shocking that trees in the uncivilized parts of the earth are just as wild as the other denizens of the region?

BOOKS AND WRITERS

The title of Maud Going's new book "Our Field and Forest Trees" exactly describes the contents, but no one need expect to find between its covers an account of the botanical characters of our native trees. There is not even a list of trees in the book, nor a scientific name, and yet it very entertainingly says all that may be readily said about trees as living things. A good many authors seem to think that the really significant facts about a tree are embraced in the scientific descriptions when, as a matter of fact, the technical stuff in

which they so deeply delight is merely an introduction to dendrology and the things that really count with the public are the economic and ecological aspects of the subject. The author takes it for granted that her readers know the names of the trees and proceeds at once to tell about the national forests, cork and bark, midwinter forests, forest fires, the ascent of sap, and kindred topics to the extent of nineteen chapters and more than 200 pages. There are also about 60 illustrations. This is one of the books that has gotten past the "How to Know" stage and is all the better for it. It is published by A. C. McClurg & Co., Chicago, at $1.50.

Dr. William F. Ganong, Professor of Botany in Smith College, has issued a "Textbook of Botany for Colleges" from the press of the Macmillan Company, New York. This is the first of two volumes, or rather the first part of a larger volume, intended to serve as an introduction to botany for those without previous knowledge of the subject. The author's name is sufficient guarantee that the information it contains is complete and up-to-date, but the reader is likely to be impressed with the fact that the presentation is dominated by the taxonomic aspect of botany which is still so much in evidence in the Eastern States. Many pages remind one vaguely of Gray's "How Plants Grow," though this is a greatly amplified account of the subject with considerable economic and ecological matter added. Since the book is designed largely for those who wish a general acquaintance with botany, more attention is given to the larger aspects of the subject than to minute details. The sequence of the first part is leaves, stems, roots, flowers, fruits, and seeds, with a discussion of the morphology and physiology of each. The second part is to be devoted to the kinds and relationships of plants. The first part contains 390 pages and costs $2.00.

It is not likely that Prof. W. R. G. Atkins' "Some Recent Researches in Plant Physiology" will ever become popular with

the general reader. It requires something of an education in both botany and chemistry before its contents become intelligible, but with this equipment it becomes an exceedingly interesting account of what has recently been done in certain lines of plant activity. Among the subjects treated are the carbohydrates of plants, pectins, osmotic pressures, the plant oxidases and their relation to color, etc. in the plant, this last being one of the most interesting chapters in the book. Although the bulk of the work is the author's own, he has carefully reported the investigations of others bearing on the subjects in hand, and a bibliography of nearly 500 titles is given. Prof. Atkins is connected with the University College, Dublin, and his book is published by Whittaker & Co., London. It is for sale on this side by the Macmillan Company at $2.40.

THE AMERICAN BOTANIST

A QUARTERLY JOURNAL OF ECONOMIC AND
ECOLOGICAL BOTANY

EDITED BY WILLARD N. CLUTE

Volume XXIII.

JOLIET, ILL.
WILLARD N. CLUTE & CO.
1917

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ILLUSTRATED ARTICLES MARKED WITH A STAR (*).

NOTE AND COMMENT

Vol. 23. No. 1 Whole Number 112

THE AMERICAN BOTANIST

FEBRUARY, 1917

35 Cents a Copy; $1.25 a Year

WILLARD N. CLUTE & CO.

JOLIET, ILLINOIS

The American Botanist

A Quarterly Journal of Economic & Ecological Botany

WILLARD N. CLUTE, EDITOR

SUBSCRIPTIONS.—The subscription price of this magazine is $1.25 a year or $2.00 for two years, payable strictly in advance. The magazine is not sent after subscriptions expire. Personal checks on small or distant banks must contain ten cents for collection fees. The magazine is issued on the 20th of February, May, August and November.

BACK NUMBERS.—Volumes 1 to 10 inclusive consists of 6 numbers each, Vols. 11 to 13 of 5 numbers each and all later volumes of 4 numbers each. The first 18 volumes may be had for 75 cents a volume, or the set will be sent for $9.00. The next 4 volumes $1.00 each or the set for $3.25. A full set contains 2968 pages.

THE FERN BULLETIN

In 1913, at the completion of its twentieth volume, **The Fern Bulletin** was consolidated with this magazine. The back volumes average more than 100 pages each, and since they cover the entire formative period of American Fern study they are invaluable for reference. The majority of new forms discovered in recent years have been described in its pages. First six volumes out of print. A set of vols. 7 to 20 will be sent for $8.00. An extended description of the contents of the volumes may be had for the asking.

WILLARD N. CLUTE & CO., PUBLISHERS

207 WHITLEY AVENUE, JOLIET, ILL.

ENTERED AS MAIL MATTER OF THE SECOND CLASS AT THE POST OFFICE, JOLIET, ILL.

THE FAIRY LILY.—*Zephyranthes carinata.*

The American Botanist

VOL. XXIII JOLIET, ILL., FEBRUARY, 1917 No. 1

Within the woods,
Tufts of ground laurel, creeping underneath
The leaves of the last summer, send their sweets
Upon the chilly air, and by the oak,
The squirrel-cups, a graceful company,
Hide in their bells a soft aerial blue.

—BRYANT.

THE FAIRY LILY

By Willard N. Clute.

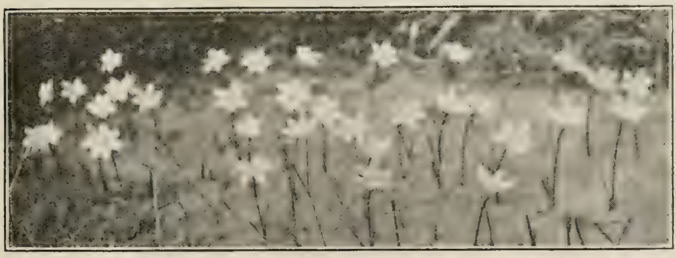
THE fairy lily is not a favorite with the aristocratic gardener and its name is often missing from the nursery catalogues and other registers of superior flowers, but it is an interesting and attractive flower, nevertheless, and well worth the room it requires in some out-of-the-way spot in the garden. In less pretentious circles, however, the plant still finds much favor. Its bulbs are a favorite article of exchange between flower-loving housewives, and one may often find a colony of it flourishing in an old bucket or similar receptacle on the doorstep or given a more prominent place among the geraniums and petunias of a cottage window garden.

One of the features that make the fairy lily valuable is its readiness to bloom. Often in less than a week after the bulbs are placed in the soil, the first flowers are up and

spreading a welcome to the insects, a record for alacrity that few other plants can equal. In no case are the flowers likely to be slow in appearing. A glance at our illustrations will show how slow leaf growth is in comparison with the development of the flowers. Though the bulbs seldom produce more than two flowers at a time, they may blossom more than once during the summer and in this way prolong the blooming season. Several causes may operate to produce new crops of flowers. Sometimes a soaking rain after a prolonged dry spell will do it; in fact, alternating drouth and moisture seem to perfectly fit its requirements.

Though called lilies, these plants are lillies by courtesy only. They really belong to the allied family of the Amaryllidaceae which is characterized by lily-like flowers with the ovary inferior instead of superior as in the lilies. Our plant was once considered an *Amaryllis* in good standing, but the generic name is now retained for species with zygomorphic (irregular) flowers, while those species with regular flowers are included in the genus *Zephyranthes*, named from *Zephyros* the west wind. The generic name has apparently suggested the book names of zephyr lily and flower of the west wind. A good example of a true *Amaryllis* is the well-known Johnson lily (*Amaryllis Johnsoni*) whose red flowers in clusters at the top of a tall stalk are familiar sights in many plant collections. The plant commonly cultivated as the fairy lily seems to be *Zephyranthes carinata* which grows wild in the West Indies and Mexico. The catalogues usually list only *Z. rosea* but this is a smaller and autumn flowering species which grows in Cuba. If *rosea* is ordered, however, it is likely that *carinata* will be sent. The nurserymen only approximate correctness in nomenclature.

A companion species to the fairy lily is a pure white flowered form, *Zephyranthes candida,* native of the marshes along the La Plata. It is not a mere albino form of *carinata* or *rosea* but may be distinguished from these by the possession of a capitate stigma. The others have a three-lobed stigma. A yellow-flowered species *Z. Texana* may occasionally be had but no recent catalogue that we have consulted contains it. There are several other species in the warmer parts of the world and one *Z. atamasco* grows wild as far north as Virginia, and still farther if protected in winter. It may be added that certain botanists have recently attempted to change the generic name of the fairy lilies to *Atamosco.* The species of eastern America which is commonly called the atamasco lily would in the new terminology be called *Atamosco atamasco* (both terms are correctly spelled) but we are thankful that no law obliges us to call it that!



OUR MOST FRAGRANT FLOWERS

THE attempt to name the most fragrant American wildflower has resulted in considerable difference of opinion. This, however, was not unexpected. Our country is so large that no native species is common to all parts of it and each region is likely to have its own candidate for the honor. Even in more restricted areas it is often difficult to decide the merits of rival species. There is so much besides mere fragrance that must be taken into account. Rev. Geo. A. Fuller of Massachusetts, writes: "I think the most powerful fragrance is that of the azalea, both pink and white, the sweetest the white water lily, and the most subtile, the arbutus. Charles C. Plitt, of Baltimore, after mentioning arbutus, pipsissewa, and *Schweinitzia* (*Monotropsis*), votes for the partridge berry (*Mitchella repens*). C. L. Gruber, balancing the claims of the common locust (*Robinia pseudoacacia*) and the wild crab (*Pyrus coronaria*), stands for the former. In Maine, William Hoyt favors the white water lily with the trailing arbutus and the white bog orchid (*Habenaria dilatata*) as close competitors, and in New Hampshire, Miss S. F. Sanborn favors *Linnaea borealis,* John Burroughs is on record as favoring the horned bladderwort (*Utricularia cornuta*). Of this he says: "In a warm moist atmosphere the odor is almost too strong." On the whole the New England vote is for the pink azalea (*Azalea nudiflora*), with the white water lily (*Castalia odorata*) second. It is a question whether the fragrance of the arbutus is not enhanced by the fact that it is our first fragrant wildflower of the year.

Further south the azalea still has many friends, and Mrs. G. W. Sirrine of South Carolina votes for it, but cites the arbutus for favorable mention. In this part of the world it has strong rivals, however. Ellis B. Noyes of Virginia, suggests the jasmine (*Gelsemium sempervirens*), the small magnolia (*Magnolia glauca*) or the arbutus. With these species for a foundation we hope for a revised list and a more extended vote. The southern States are singularly lacking in botanists and botanizers and no reports have been received from the region. Drawing on his own experience, therefore, the writer suggests the big magnolia (*Magnolia macrophylla*), the Chicasaw plum (*Prunus Chicasa*) or the azalea as likeliest to deserve the honor.

In the North Central States, Mr. Gruber's suggestion of the wild crab finds support from Miss Emma E. Laughlin in Ohio, Mrs. M. E. S. Charles in Indiana, and from the home of this magazine in Illinois, though the editor is inclined to favor the wild grape over anything that grows. H. G. Wolfgang in Ohio, supports the spotted wintergreen (*Chimaphila maculata*). In Nebraska, Rev. J. M. Bates votes for *Mentzelia odorata*, though admitting the claims of the Iowa crab (*Pyrus Ioensis*) which, however, is rare in that region. Unfamiliar with the *Mentzelia*, we wonder how its fragrance compares with that of the golden currant (*Ribes aureum*) which is so often selected for planting in the East.

On the Pacific Coast, differences of opinion coinciding with latitude are noted. Rev. W. A. Squires writes from San Francisco, that California wildflowers are conspicuously lacking in perfume, and suggests that the flower most gifted with fragrance is the redwood lily (*Lilium rubescens*). Fred E. Burlew of Los Angeles, names as his preference another lily—

L. Parryi—which he calls lemon lily, while Miss M. L. DeLange of La Jolla votes for the violet nightshade (*Solanum Xanti*).

Though reports from many other localities must be received before the question can be fairly settled, a good beginning has been made and it is hoped that many more will express an opinion on the subject to the end that foreigners visiting our country, or residents of one section visiting another, may have some idea of what attractions the flora holds for them.

A considerable number of flowers have been suggested as being worthy of being called the most beautiful single species. The orchids, as might be expected, are strong favorites. In the New England States the arethusa (*Arethusa bulbosa*), Pogonia (*Pogonia ophioglossoides*), grass pink (*Calopogon pulchellus*), fringed orchid (*Habenaria psycodes*), and *Orchis spectabilis* are mentioned. Farther south the votes are for the pink or yellow lady's-slipper (*Cypripedium*), the fringed polygala (*Polygala pauciflora*), the trumpet honeysuckle (*Lonicera sempervirens*) wild rose, and the pansy violet (*Viola pedata*). Mr. Noyes suggests the orchid like spring iris (*Iris verna*) and the cardinal flower (*Lobelia cardinalis*). In the North Central States the great white trillium (*Trillium grandiflorum*), and showy lady's-slipper (*Cypripedium reginae*), white adder's-tongue (*Erythronium albidum*) and the wild crab are mentioned. Farther west the prickly poppy (*Argemone alba*), *Talinum calycinum*, and *Eustoma Russellianum* are suggested. The latter plant under the name of Texas blue-bells is now being introduced to the Trade. On the Pacific Coast the Matilija poppy (*Romneya Coulteri*) has the preference, though the Mariposa tulip (*Calochortus venustus*), the white globe tulip (*C. albus*), and *Lathyrus splendens* are mentioned.

It has been much easier to select the finest flower for massing. In the North Atlantic States, the mountain laurel (*Kalmia latifolia*) wins easily, but lupine (*Lupinus perennis*), the showy lady's-slipper, the cardinal flower, the butterfly weed (*Asclepias tuberosa*), the lungwort (*Mertensia Virginica*), the flowering dogwood (*Cornus florida*) and the bluet (*Houstonia coerulea*) have many admirers. Mr. Hoyt writes from Maine: "Nothing to my mind excels the showy lady's-slipper when seen in clumps of from ten to thirty stalks, with usually two flowers on a stalk, the pure white flowers blotched and stained on the lip with crimson apparently spilled over the flower." In the Middle West the wild crab and blue-eyed Mary or innocence (*Collinsia verna*) compete for first place though the prairie phlox (*P. pilosa*) is also mentioned. Farther west the white evening primrose (*Hartmannia speciosa*), New England Aster (*Aster Nova-Angliae*) and *Verbena stricta* have the preference. The Pacific Coast is true to the California poppy (*Eschoītzia Californica*). Of this flower Rev. W. A. Squires writes: "It is a magnificent flower even when seen singly, being fairly dazzlingly bright in well developed specimens, but it is even more striking when seen in masses. When the growing season has been favorable, this flower fairly sets the hills on fire about San Francisco Bay. If you come in from the Pacific through the Golden Gate in the proper season you will notice that the Marin hills, the heights of Angel Island and the Berkeley highlands are lit up with a golden glow like that of the sunset. It is due to the great natural beds of the California poppies."

In view of the fact that no less than three States have adopted the goldenrod as the State flower, it is remarkable that this genus of plants failed to receive a mention. The plants,

however, are often exceedingly graceful as well as beautiful. No doubt their abundance and weed-like qualities in certain situations have militated against any claims to beauty they may possess.

THE MONTEREY CYPRESS

By Walter Albion Squires.

A SPECIES of plant which is on the verge of extinction possesses a peculiar interest for the thoughtful botanist. Such a plant is playing the last act of a tragedy ages long. Perhaps it has been waging its losing fight for life through a hundred centuries and now that it is about to bid an everlasting farewell to earth, the effects of its long struggle are written in root and stem and leaf. Even the habitat of such a plant is often an eloquent witness to its long and losing fight for "a place in the sun"; for it has usually been pushed down and out until you find it making its last stand on the very edges of the world. If it be an herbaceous plant it has become depauperate in form; a mere suggestion of what it was in the days of its prosperity. The little *Schizaca* hiding in the grass and drawing its scanty sustenance from the soil of barren sand was in all probability at one time a lordly plant among the denizens of the archean swamps. The humble club mosses are lineal descendants of the huge plants whose fallen trunks have made the coal measures.

On the storm-beaten cliffs of the California coast south of the Bay of Monterey, a certain species of conifer known to botanists as *Cupressus macrocarpaa* or Monterey cypress, is

making its "last ditch" fight for existence. This tree is found growing in a wild state nowhere else on earth. There are two groves; the larger of the two is north of Carmel Bay and extends along the sea for about two miles and backward from the sea about forty rods. The other is south of Carmel Bay and is only a few acres in extent covering the rugged headlands of Point Lobos. Many of the trees have a most precarious foothold in crevices of the bare wind-swept and wave-beaten promontories and cliffs. These trees in exposed situations are often fantastically molded by the force of the ocean winds. One in the north grove has the appearance of a gigantic bird and is locally known as the ostrich tree. The south grove on Point Lobos grows on such rocky storm-beaten headlands that no other tree on earth, so far as I know, would ever attempt to dispossess it of its wild home. Its fight is with ocean winds and angry seas. Most of the north grove is on more level ground and it is closely beset by a dense forest of Monterey pine, which rises in a pure stand on all sides of it except the seaward side, and crowds into it at many places almost as far as the edges of the cliffs. As one sees the pines encircling the cypresses and crowding in among them he can almost believe that the pines are making their final assault on the cypresses with the determination of pushing them into the sea. The guides have some wonderful stories to tell of these old cypresses, and many tourists go away firmly believing that they are cedars of Lebanon planted by the early Franciscan padres. This seems to be a case of the use of fiction where the truth would be far more impressive and more deeply interesting.

This species of cypress was doubtless at one time widely distributed on the Pacific coast, but slow climatic changes and the coming in of other trees more fitted to survive has driven them from every locality they once held with the exception of this remarkably limited portion of the very fringe of the continent. The Monterey cypress is a tree of great beauty as it is seen in its native habitat. Its color is of the darkest green and its large cones are touched with bronze. It possesses what an artist would call "character"; and at least one painter has become world-famous because of the pictures he has painted of the Point Lobos trees.

Though its native habitat is so small, the Monterey cypress is in no danger of becoming actually extinct since it has been planted extensively as a shade and ornamental tree in many parts of the world. Seeds from these storm-twisted veterans of the rocky cliffs have been taken by nurserymen and thus it has happened that their progeny are now to be found in many lands. The tree does especially well in Australia and New Zealand and it has been extensively planted in these countries both as a shade and forest tree. Thus through man's agency this tree, once confined to so small a portion of the Pacific coast of North America, has become one of the widely distributed trees of the world. Perhaps some person reading this article has a Monterey cypress in his garden and this little glimpse into its ancestry will cause a new association of interest to cling to that garden tree of his. If this proves to be so, I shall be repaid for the few minutes spent in setting down my thoughts here.

NATIVES GATHERING AGAVE JUICE FOR PULQUE

By H. E. Zimmerman.

PULQUE is the favorite beverage of the Mexicans and of the inhabitants of Central America and parts of South America. It is made from the juice of the different species of the agave or century plant, which is collected by cutting out the flowering stem from the midst of the leaves in the beginning of its growth, and scooping a hole for the juice. From this cavity large quantities of juice are removed daily for months. The juice is an agreeable drink when fresh, but is more generally used after fermentation, when it has a very pleasant taste, but a putrid smell, disgusting to those unac-

customed to it. Pulque is retailed in Mexico in open sheds called pulqerias, which serve also for dancing rooms. When mixed with water and sugar, and allowed to ferment for a few hours, it forms a beverage called tepache. A kind of spirit is also prepared from it. Native Mexicans are seen in the picture gathering this juice into skins of animals.

THE CALIFORNIA FUCHSIA

By S. L. Watkins.

THE California Fuchsia (*Zauschneria Californica*) is truly a magnificent perennial worthy of being extensively cultivated. It will succeed almost anywhere in the United States without special protection. In its native home in the Sierra Nevada mountains of California it inhabits the borders of mountain streams, and I have found it along the borders of streams where in winter the plant would be frozen solid for six weeks at a time. It grows in rocky crevices and other inaccessible places, and is not particular as to soil. We have grown it in very dry localities and found it to stand a great amount of drouth.

The plant attains a height of nearly two feet and forms a dense spreading clump. The leaves are willow-shaped and of a brilliant silver green. It blooms luxuriantly during September, October and part of November. The blossoms are about an inch in length, lustrous fire-red in color and are extremely beautiful. It makes an excellent border plant and as a cut flower is unrivalled. It is easily propagated by cuttlings and seeds. A nursery company in Massachusetts which deals largely in hardy herbaceous peren-

nials has the following description of the plant in its catalogue:

Ordinarily we should consider this plant tender but we received our original stock from the Huachuca mountains of Nevada and the plant has braved three winters with us. A bushy shrub-like plant with narrow, willow-like, deep glossy green foliage and in late autumn producing beautiful fuchsia-like flowers of a dazzling crimson-scarlet. The most brilliant-flowered, late-blooming perennial in our collection. We feel justified in saying that this plant will have a wide range of cultivation when better known.

FRAGRANT WILDFLOWERS

IT is astonishing that more attention has not been paid to our fragrant wildflowers. The botanical manuals usually mention the possession of fragrance when this is among the more noticeable of the plant's characteristics, but otherwise the perfume is likely to be overlooked although in the case of our garden species the item of fragrance is considered one of prime importance. It is likely that few insect pollinated plants are entirely lacking in odor. The insects, at least, act as if most flowers were fragrant to them, but since insects do not smell with their noses as mammals do it is likely that our list of fragrant flowers would be very different from that compiled by a bee if such a thing were possible.

A most interesting list of fragrant wildflowers of New England and New York by John Burroughs, published in "Pepacton" is here given as a basis upon which a more extended and complete list may be constructed. Some mention of the subject in this magazine will be found in the following references: **7**:73, **8**:16, **10**:73, **17**:113, **21**:35, 63.

LIST OF SPECIES.

White violet (*Viola blanda*). White.
Canada violet (*V. Canadensis*). Purplish.
Trailing arbutus (*Epigaea repens*). Pink.
Mandrake (*Podophyllum peltatum*). White.
Yellow lady's-slipper (*Cypripedium parviflorum*). Yellow.
Purple lady's-slipper (*C. acaule*). Pink.
Squirrel corn (*Dicentra Canadensis*). White.
Showy orchis (*Orchis spectabilis*). Pinkish.
Purple fringed orchis (*Habenaria psycodes*). Pink.
Arethusa (*Arethusa bulbosa*). Pink.
Calopogon (*Calopogon pulchellus*). Pink.
Ladies' tresses (*Spiranthes cernuum*). White.
Pond lily (*Nymphaea odorata*). White.
Twin flower (*Linnaea borealis*). White.
Sugar maple (*Acer saccharum*). Yellowish.
Linden (*Tilia Americana*). Yellowish.
Locust (*Robinia pseudacacia*). White.
White alder (*Clethra alnifolia*). White.
Smooth azalea (*Azalea arborescens*). Pink.
White azalea (*A. viscosa*). White.
Pinxter flower (*A. nudiflora*). Pink.
Yellow azalea (*Azalea calendulacea*). Yellow.
Sweet bay (*Magnolia glauca*). White.
Partridge berry (*Mitchella repens*). White.
Sweet colt's-foot (*Petasites palmatus*). Whitish.
Pasture thistle (*Cnicus pumilum*). Pink.
False wintergreen (*Pyrola rotundifolia*). White.
Spotted wintergreen (*Chimaphila maculata*). White.
Princes pine (*C. umbellata*). White.
Evening primrose (*Oenothera biennis*). Yellow.
Hairy loosestrife (*Lysimachia ciliata*). Yellow.
Dogbane (*Apocynum androsaemifolium*). Pinkish.
Ground nut (*Apios tuberosa*). Brown-purple.
Adder's-tongue pogonia (*Pogonia ophioglossoides*). Pinkish.
Horned bladderwort (*Utricularia cornuta*). Yellow.

TRAILING ARBUTUS FROM SEED

ALTHOUGH it is now several years since the secret of cultivating the trailing arbutus was given to the world, it will probably take several years more to thoroughly disseminate this knowledge and dispose of the old idea that it requires some kind of necromancy to induce this most attractive of our native heaths to bloom or even to live under the ministrations of the gardener. That the plant may now be grown from seed, like any other plant, is shown by the following excellent account of an experiment of this kind by Anna D. White which is taken from the *Proceedings of the Delaware County Institute of Science.*

The idea of obtaining trailing arbutus plants from seed instead of by the often attempted and usually unsuccessful method of transplanting plants from the woods, was first suggested to me by Mr. Frederic V. Coville of the United States Department of Agriculture. I was much pleased by his beautifully-blooming pots which I saw in April 1913 in the Department greenhouses at Washington. Mr. Coville gave me full cultural directions and my subsequent partial success with arbutus has been the result of his advice. The following notes are a summary of the steps in its culture.

July 9, 1913, a small quantity of arbutus seed obtained after much searching from the white fleshy berry of wild plants in New Jersey, was planted in soil composed of two parts peat to one of white sand. About August 13th the first minute seedlings appeared. They were wintered in a

shady corner of a rose greenhouse. In February 1914, fifty plants ranging from one-eighth to three-eighths of an inch in diameter were transplanted to two-inch pots in soil composed of nine parts peat, one part sand, and three parts broken crock. By July 1914 the plants were just beginning to send out side shoots and were shifted to three-inch pots. They spent that summer and the following winter plunged in the ground in a shady outdoor spot. In July 1915, they had reached sufficient size to be put into five-inch bulb pots and in the fall of 1915 many of the plants, though not all, set flower buds. After thorough freezing, two or three pots, as an experiment, were brought into a cool shaded greenhouse. On February 22, 1916, one plant with four flower clusters was in bloom having been in the greenhouse just two weeks. Others bloomed later according to the treatment they received. The sensation of smelling real arbutus in pots in midwinter fully repaid for the two and a half years of waiting and watering.

HETEROPHYLLY IN WATER PLANTS

THE phenomenon of heterophylly, that is, the presence of two or more kinds of leaves upon the same plant, is not by any means confined to water plants, but in this very varied and wide class it is especially noticeable. It is useful, in considering the types of leaves found in aquatics, to remember that although in the process of evolution the plant world is supposed to have passed from water to land types, yet our present flowering aquatics are all regarded as having been, so to speak, crowded off the dry land and pushed back into the

water, surviving only in the struggle by adapting themselves to their changed surroundings.

The adaptability of many water plants is well seen in their heterophyllous characteristics. For example, the water buttercup (*Ranunculus aquatilis*), a slender little plant found in slow-running streams or ponds, has submerged leaves which are divided into a large number of threadlike green segments, offering little or no resistance to the water. The plant also bears floating or aerial leaves which are oval, three-lobed and spreading; thus we find on the plant two entirely distinct forms.

The yellow water lily (*Nuphar lutea*) when growing in deep water is typically heterophyllous. The totally submerged leaves are long, narrow and undivided with no distinction into blade and stalk and offering little resistance to running water. Such ribbon or band-like leaves are very usually found on aquatic plants, that is, submerged forms of *Potamogeton, Sagittaria* and others. *Nuphar lutea* also produces, besides the ribbon type, broad, oval leaves having long petioles, the lamina or blade floating upon the water surface. The margin is usually entire and curved slightly upward all round. This is a precaution taken by the plant to prevent the encroachment of water upon the upper side of the blades. For the same reason the surface is glabrous, throwing off the water very readily. The stomata are large, and occur only on the upper side of the leaf.

Similar forms of heterophylly are seen in the floating pondweed (*Potamogeton natans*) and in the tropical water lily, *Victoria regia*. The arrowhead (*Sagittaria sagittifolia*), a handsome British plant, produces long ribbon leaves under water and bears also aerial leaves standing out above. These are arrow-shaped, and resemble in all points of structure the

foliage leaves of land species. However, if grown in flowing water, *Sagittaria* will produce the submerged ribbon type of leaves only. The plant thus forms a good example of the readiness with which aquatics adapt themselves to a constantly changing environment. Similarly, a variety of water buttercup, *R. fluitans,* found in running streams bears submerged finely segmented leaves only, no aerial leaves being developed. —*Botanical Journal.*

A SIX-LEAVED DENTARIA

By B. O. Wolden.

ONE of the commonest of early spring flowers found in the woods of Iowa is the toothwort or pepper-root (*Dentaria laciniata*). Often the snow lies deep near the bare spots when it first pushes out of the ground with stems, leaves and buds all at once. But though it is the first of the wood flowers to greet us with its buds, it does not come into bloom until one or two weeks after the bloodroot has braved the April frosts and several others precede it by a few days.

It does not take a great deal of observation to learn that this species of *Dentaria* is a very variable plant. Some specimens have the divisions remotely and regularly toothed while others are sharply and irregularly toothed and incised. It is easy to collect half a dozen specimens that vary differently in this respect.

We have, however, here in our local woods, a form that differs in another respect from the common form described in the Manuals. The species is described as having

three stem-leaves, mostly in a whorl. The form has six leaves, the first three being generally alternate with the three smaller leaves above mostly whorled through sometimes alternate. The irregularly and much toothed leaflets and upright habit differ very strikingly from our common form with its more spreading leaves and remotely toothed leaves and segments. Between the two extremes, however, there are many shades of variation and the only constant character that separates this particular form from the rest are the extra leaves. The flowers are smaller than in the usual form with petals only twice as long as the sepals. They are generally three times as long, but in this respect there is much variation.

When some years ago, as a beginner in the study of the local flora I discovered this leaf variation my first thought was that I had discovered a new species. However, it seems that in a species that includes such a range of forms as does *Dentaria laciniata*, the characters mentioned can hardly be considered specific, but as no mention is made in the Manuals of a six-leaved *Dentaria*, the fact that such a form occurs should be of sufficient interest to be recorded, and as the editor of the *Botanist* has suggested that all such plant forms should be named in order to facilitate future mention of the same, I would therefore characterize this as

DENTARIA LACINIATA F. HEXIFOLIA.

This differs from the type in having six leaves, the lower three mostly alternate and the smaller upper leaves often whorled; leaflets much toothed. Flowers small, about 1 cm. long or less. Frequent in the woods around High Lake, Iowa.

THE CRAPE MYRTLE

By Mrs. Georgia Torrey Drennan.

MOBILE, New Orleans, Galveston and all other Southern seaboard cities are in gala attire from July till November, for the crape myrtles (*Lagerstoemia Indica*) are in bloom. They are of three kinds, pink, white and red, but when general reference is made to the crape myrtle, the pink is meant. It is the most beautiful and profuse of all the three colors. The shade of pink is that of the heart of a ripe watermelon, and the texture of the flower is so fine that the tree when in full bloom seems to be hovering under a pink sunset cloud.

To read the description given in botanies, "petals 6, very wavy-crinkled, raised on slender claws borne on the throat of the calyx," one would never form an idea of the unique and curiously constructed flower. The buds are like hard, dark green balls. They form on the terminals of every branch in elongated clusters of twenty or more. The thick, leathery calyx is five pointed and closely clasped together. First, the points of the calyx snap open and turn back; then, from each one, five slender pink threads project, tender and light as thistle down; at the end of each thread is a petal—a delicate, tissue-like crinkled bit of pink, tremulous and light. There are twenty or more flowers ranged along the stem, which may be ten inches long, and proportionately full. One might infer the flower to be of brief duration, each petal swinging on a thread so slender. Such is not the case, for the blooms last long and are slow to shatter or fade.

The tree form is the result of trimming, as the myrtle naturally forms a clump. It begins to bloom when but a little switch of a plant and multiplies rapidly, the side shoots coming up from the root all around. Left to nature, these clumps are beautiful when in bloom. The central tall shoots and the tapering side shoots, down almost to the ground, are pink and bright, a perfect pyramid of flowers for four months of the year.

It is from these unpruned clumps that plantations are made. The approved method is to set one shoot in a place and keep all side shoots cut away until the plant grows tall and strong, forming a symmetrical tree. Twenty year old myrtles rarely attain the size of an average peach tree. The branches are evenly and gracefully set, never straggling and unbalanced. The foliage is borne evenly along each side of the smooth, lithe branches, and is remarkably persistent for a deciduous tree, turning brilliant crimson late in autumn.

The crape myrtle is an exceedingly long lived tree. Always one of the components of gardens, parks, and arboretums in the South, it is quite common to see it vigorous and free-flowering upon old home sites where every other mark of former habitation has been obliterated.

JOHN BARTRAM

"ONE day I was busy in holding my plough (for thou seest I am but a simple ploughman) and being aweary, I sat me beneath the shade of a tree to rest myself I cast mine eyes upon a daisy. I plucked the pretty flower, and viewing it with more closeness than common farmers are wont to bestow upon a weed, I observed therein many curious and distinct parts, each perfect in itself, and each

in its way tending to enhance the beauty of the flower. 'What a shame,' said my mind or something within my mind, 'what a shame that thou hast spent so many years in the ruthless destroying of that which the Lord in His infinite goodness hath made so perfect in its humble place, without thy trying to understand one of its simplest leaves.' This thought awakened my curiosity, for these are not the thoughts to which I had been accumstomed. I returned to my plough once more; but this new desire for inquiry into the perfections the Lord hath granted all about us did not quit my mind; nor hath it since."

Thus spoke the venerable John Bartram in his later years of ripeness—the daisy converted the sturdy, Pennsylvanian Quaker farmer into a scientist, the fellow of the greatest intellects of his day. It is a curious fact that of the first botanists of that day, Peter Collinson, Dr. Fothergill, John Bartram and Humphery Marshall were all Quakers and the last two Pennsylvanians; and it is interesting to consider the bent of mind that caused such to be the case. Even of later years our chief botanists have had more than the relative amount of Quakers in their ranks. John Bartram was never a voluminous writer; self educated, and from inefficient books, he seems always to have handled the pen with a certain stiffness. In his letters he occasionally breaks into a really fine paragraph; but in spite of a certain directness and freedom from verbosity, he evidently does not feel at liberty with his ink-horn. It was this fact, doubtless, that tended to lose in the dust of the past a name that otherwise would have held its place with the greatest. But his life was of inestimable value, pouring its rich storehouse of learning into Europe, contented that the fruit of

his labors should live though his name should itself pass away. He lived until about eighty years of age, hale and strong, his only trouble being his dread that the iron heel of the Revolutionary War might tramp through his peaceful gardens. He was spared this trouble for all alike reverenced and loved this gentle old man. After a very brief illness, shortened, it was said, by the battle of Brandywine, which occurred just prior to his death, he passed away, leaving behind him a son (William) to perpetuate his name and labors and to preserve intact the Bartram Botanical Gardens.

NOTE *and* COMMENT

The Jasmine.—There are few better illustrations of the confusion that results when common names alone are used than in the one embodied in the title of this paragraph. When the name yellow jasmine is used, *Gelsemium sempervirens,* one of the Loganiaceae is usually meant. This plant, however, is often called false yellow jasmine, and when we hunt for the true one, we find another yellow jasmine or rather yellow jessamine (*Jasminum fruticans*) which, with the white jessamine (*J. officinale*), represents the Jasminaceae in the southern United States. The last mentioned species is exceedingly fragrant and yields the oil of jessamine used by the perfumer. Its yellow congener, however, lacks fragrance and the uninformed, inclined to classify flowers by their most obvious characteristics, are inclined to substitute the fragrant *Gelsemium sempervirens* for it in any mental conception of the genus he may make. The cape jessamine, also common to the South, is still another species that needs to be distinguished. It belongs to the Rubiaceae and is known as *Gardenia florida.* Though called cape jessamine it is not a native of the Cape of Good Hope but comes from China. *Jasmine fruticans* is also an exotic from southern Europe and *J. officinale* is from Asia, so that the false yellow jasmine is the only true native in the list.

Yellow Buffalo Berries.—All the leading manuals of botany state that the buffalo berry (*Shepherdia argentea*) has

scarlet berries which are edible and sour, yet there is a form that has bright amber-yellow berries which are only slightly acid. There is no apparent difference between the shrubs that bear the scarlet berries and those that bear the amber yellow ones. The latter form is reported to be abundant in South Dakota between the Missouri river and the Black Hills. Dr. C. E. Bessey reported that this form is found in Northern Nebraska. I have found and eaten the amber-yellow berry in central Nebraska near North Loup.—*L. F. Sallee, Platsmouth, Nebr.*

THE JAPANESE LADY FERN.—In the temperate regions at least, cultivated ferns seldom run wild. There are instances in the United States of such occurrences, however. The long leaved bracken (*Pteris longifolia*) grows so luxuriantly upon the old tombs in the New Orleans cemeteries that cart-loads of it have to be removed annually. In the same situations, and on old walls, elsewhere, the saw-leaved bracken (*Pteris serrulata*) finds a home and the Japanese climbing fern (*Lygodium Japonicum*) has been reported as an escape from cultivation in Georgia. Fine plants of *Nephrodium patens* or *N. molle* used to grow on the walls of the cut through which the New York Central Railroad reached its station at 49th street in New York. The only instance in the northern States where an exotic fern has established itself and showed a tendency to conquer more territory seems to be that of the Japanese lady fern (*Athyrium Nipponicum*). This interesting relative of our common lady fern (*Athyrium filix-foemina*) has been found wild in both New York and Connecticut. In both localities it is known to be an escape. In New York it is known to have gotten its start from some plants thrown out of a greenhouse which, instead of dying as exotic plants are expected to

do under such circumstances, found the world to their liking and continued to live and thrive.

Germination of Acorns.—It is well known that the seeds of many plants will not grow as soon as ripe, but require a certain period of rest before growth is resumed. In consequence of this, it is customary for foresters and nurserymen to stratify the seeds of trees and shrubs in moist sand and bury them in the soil over winter. It now appears, however, that the need of a rest period for some seeds is not as important as has been assumed. A number of specimens are known whose seeds under proper conditions will grow as soon as ripe, and in the case of the tomato, seeds taken from green fruits have been known to sprout. Beans will often sprout in the pod if the late summer happens to be moist. Probably the most celebrated instance of seeds sprouting while yet attached to the plant is afforded by the mangrove (*Rhizophora mangle*) in which the seeds develop into young plants of considerable size before separating from the parent plant. This phenomenon has been found, though in a lesser degree, in some of our oaks. In the red oak it is found that the young plant after filling the seed, continues to develop while still attached to the tree. Dr. John H. Harshberger has investigated other oaks and finds that the acorns of the white and black jack oaks will grow as soon as ripe if the shells are not allowed to become dry. That the seeds of the white and red oaks will grow the same season they are produced has long been known. Under favorable conditions one is likely to find, late in fall, that the acorns have already pushed down good-sized roots though no sign of a shoot will be visible until spring.

Sweet Gum.—Everybody in the Gulf States and for some distance north and east of that region knows the sweet gum (*Liquidambar styraciflua*), whether they call it by this name or know it as bilsted, star-leaved gum, or alligator tree. It is not likely, however, that many of them realize that this tree is a close relative of the witch hazel (*Hamamelis Virginiana*), but both belong to the Hamamelidaceae. Of recent years, the sweet gum has become of much commercial importance and under the name of red gum is now used for furniture, interior finish and the like, running a close second to oak in this respect. It is estimated that one-eighth of all the hardwood still standing in the United States is red gum. Though this tree grows naturally as far north as Connecticut and southern Illinois, it thrives under cultivation much farther from the equator. The brilliant coloring of the leaves in autumn, together with their unusual shape make the trees most desirable specimens for street planting while the curious prickly globes of fruit and the corky winged branches add to their attractions. From wounds in the trunk a clear gum oozes out which is much used as chewing gum in the region where it grows. A single other species is found in Asia Minor.

Color of Lilium Philadelphicum.—The editor wrote that he would be glad to have my notes on any variation in color that I might find in the wild orange-red, or wood lily (*Lilium Philadelphicum*). As it blooms abundantly near my home this is no difficult task. I found that the flowers vary from a homely faded orange color through orange-red to a very beautiful shade of red. I selected two that showed the greatest difference in color, brought them into the house and put them side by side in a plain glass vase. It was surprising

to note the lack of red in the one and its abundance in the other. I notice that F. W. Stack in his "Wildflowers Every Child Should Know" calls this lily the red lily. I think this is a mistake for it is most usually orange-red as Gray implies by the name orange-red lily, the common name that for so long has been borne by this showy blossom.—*Mrs. Inez P. Mayhew, Chilmark, Mass.*

CAMPHORS.—When camphor is mentioned, we usually think of a certain pungent and aromatic liquid which is seldom missing from the family medicine shelf. It happens, however, that there are several other camphors and there are cases when we might have to specify just what kind of camphor was meant. For instance: menthol is a kind of camphor made from peppermint (*Mentha piperita*). Thymol is another which is derived from the common wild bergamot (*Monarda fistulosa*). The camphor best known to the public is made from *Laurus camphora*, a plant which is quite closely related to our sassafras and spicewood. Thymol is of more than ordinary interest from the fact that this is the drug depended upon for the cure of unciniariasis or the hookworm disease with which so many residents of the tropics are afflicted. Thymol, however, divides the honors with another plant in eradicating hookworm, for it has been found that oil of chenopodium, made from the seeds of *Chenopodium anthelminticum*, is quite as efficacious in its results.

FASCICLED DANDELIONS.—A species of dandelion fasciation in which three heads of dandelion flowers are blended into one, has been sent us by Mr. L. F. Sallee from Plattsmouth, Nebraska. This phenomenon is not infrequent in the dandelion and several other plants. We have found it in *Rudbeckia hirta* when as many as five heads have thus been united.

DeVries, experimenting with various plants, found that some of the fasciations came true from seeds—in good years as many as 30 or 40 in a hundred. In the first-year plants of biennials, the rosette of leaves may be affected in such a way that the stem spreads out on one side in a ribbon-shaped object to which the leaves are attached. In this journal for 1914, a fasciated example of thistle was illustrated due to this latter cause. The most familiar case of fasciation is found in the cock's-comb (*Celosia*) where the fascicled condition is so common as to seem the normal one.

VALUES IN FLORICULTURE.—The application of scientific principles to floriculture is of comparatively recent date. The flower-growing business, however, is an old one. In the early days of American flower production, commercial growers of flowering plants recognized the need of but few scientific principles. The greater number of these florists received their training abroad, and the apprentice system through which this was obtained taught methods rather than principles. These men learned how to grow plants and to know under what conditions they attained their best development, but they knew little of the reasons for their successes and failures. During the past decade, conditions have changed to a marked degree. The demand for rare flowers of better quality has steadily increased and with this demand there has come a keener competition. This competition and the demand for better products has made it necessary for present day leaders in the flower-producing industry to call on science for every assistance possible, so that there should be better methods of production at the least possible expense. The margin in the flower business is not a broad one. The flower-growing business in the United States is important. The total annual production in the United

States is valued at thirty-four and one-half millions.—*From an article by E. S. White in Gardeners' Chronicle.*

Seedless Fruits and Pollination.—A subscriber in California asks: "Do plants producing sterile fruits, such as navel oranges, seedless grapes, etc., require fertilization of the blossom, or are the fruits produced without fertilization? Do the figs of southern California, other than the Smyrna, produce their fruits without fertilization, or are both staminate and pistillate blossoms concealed in the fig cavity, so that the plant is self-fertilized?" In the case of the navel orange and the seedless grape, it would be absolutely impossible for fertilization to occur, since fertilization is the union of an egg and sperm to form a new individual, and such plants do not produce eggs. Fertilization regularly occurs in the production of seeds, or even in the production of flowerless plants such as mosses, for that matter. The query of our correspondent, however, doubtless has reference to pollination or the processes connected with the deposition of pollen on the stigmas in the flower. As to this phase of the subject nothing very definite seems to be known. As a general thing, flowers that are not pollinated fail to set fruits, but the matter is complicated by the fact that if too many flowers are pollinated, the plant cuts off some of the developing fruits. There are cases in plenty, also, in which seeds are ripened without either pollination or fertilization. The effects of pollination are often more far reaching than the mere stimulation to seed production that normally follows. Thus orchids, which remain open for several weeks if not pollinated, close very promptly when this is accomplished, the petals fall and the ovary begins to enlarge to form the fruit. It may be noted that the three kinds of fruit mentioned are each in a separate class as regards the way in which they are

produced. The grape is a ripened ovary in which seeds fail to develop, but in varieties that are not normally seedless fruits are often found which lack seed. It is quite likely that pollination has some effect here. In the case of the navel orange, an internode of the flower elongates, carrying the rudimentary seeds upward and out of what is properly the ovary, and pollination can have no effect; in fact, it is reported that the stigmatic surfaces of the flower are only imperfectly developed. The fig is really a hollow branch with the flowers (stamens and carpels) on the inside. In some varieties both kinds of flowers are in the same fig, in others they are on different plants. It is known that if the flowers of the Smyrna fig are not pollinated, the young figs drop off and it is probably correct to assume that other figs behave in a similar manner. It may be added, however, that several kinds of apples and pears are known that produce good fruits without pollination, and some varieties of forcing cucumbers develop when pollination is prevented. The field is one that is scarcely touched as yet and affords plenty of opportunities for original experiment.

EDITORIAL

Owing to the endeavors of some of our countrymen to enrich themselves, during the carnage on the other side of the world, by selling in foreign markets the commodities needed at home, the price of all materials used in the printing trades has been steadily advancing for some time. In consequence of this a large number of the smaller magazines and newspapers have been forced out of business, while others have been obliged to practice many little economies in order to keep in the game. To add to the burden of those that remain, our beneficent government, after refusing to allow quarterlies to extend reasonable credit to subscribers, now comes forward with a proposal to increase the rate of postage on matter of this class. In view of these facts, the subscription price of the American Botanist has been advanced to $1.25 a year. Present subscribers, however, need not worry about the change for it will not affect them. When the price of this magazine was increased from 75 cents to $1.00 a year, the price was not increased to old subscribers, and the present advance is of the same nature. We have always felt that some concessions are due to those who have consistently supported the magazine for a term of years—in many cases since the issue of the first number Those now on our lists, either "permanent" or annual sub-

scribers, may renew at the usual prices, year after year as long as they choose to do so. New subscribers, however, who do not belong to *The American Botanist* family, will have to stand the advance unless they get in before March 15th. This is also the last call for annual subscribers to get on the "permanent" list. By directing us to send the magazine until ordered stopped and paying for at least two years in advance at our special rate one may be transferred to this list. Our new "permanent" list at the rate of $1.00 a year will start on March 16th. All subscribers who are now paying $1.00 a year for the magazine will be billed at this rate as long as they remain subscribers. Our readers who have friends interested in botany will do us a favor by calling their attention to this opportunity. Since this magazine is not issued primarily to make money, the high cost of living will have to hit it pretty hard to make a dent in it. Our readers, however, know that the better our support the better magazine we can make and we trust they will continue to recommend it.

* * *

"The Association of American Plant Students for the Simultaneous Recording of Interesting Botanical Facts and the Promulgation of the Results Obtained," would be rather too cumbersome a title for a club or society as unassuming as that which has recently come into existence. This new species or variety ought to have a name, however, so that it can easily be referred to, and we invite suggestions for a shorter appellation from those interested. Such suggestions may come in with the next report or be sent to us on a postal card while you think of it. We also invite suggestions of other topics to be investigated. It

should be understood by everybody that this is a democratic association and every observer is welcome. What we want are the facts. Though the first announcement of this plan is scarcely two months old as this is written, the list of those who have agreed to join us is already a long one and more are coming in daily.

* * *

When up the street the postman comes, a merry roundelay he hums, for well he knows that he will bring us news that cheers like everything. Upon our desk he piles with care, mail postmarked almost everywhere. Then as we shuck the letter pile, we notice every little while, the checks that we can swap for ink, and type, and paper, food and drink, while postage stamps and dollar bills the air with their sweet rustle fills. This is the stuff that buys our stocks and keeps this journal off the rocks! But money's not the only thing that makes us lift our voice and sing. It happens nearly every day. Some old subscriber writes to say "I like your style; it pleases me; so I have written two or three short contributions just to show how notes, botanical should go." Then we arise and take the hint and turn those writings into print while every reader whoops with glee, "This journal's picking up, I see." But as we rest our nerve and brain we carol, oft, this sweet refrain: We—thanks to gods and fates and elves—don't have to write it all ourselves!

* * *

According to press dispatches, Rev. J. A. Nieuwland, editor of the *Midland Naturalist,* has invented a new kind of explosive that makes the most deadly of those now in use look like a bunch of fire-crackers, a still further proof that

a real botanist is an efficient individual. That this invention is all that is claimed for it will be readily believed along the Atlantic Seaboard, for Nieuwland has torpedoed more cherished botanical names in the past few years then the devotees of "the American Code" like to think of.

* * *

Once upon a time, John Burrough made a list of the fragrant native wild flowers of New England and New York and published it in his book "Pepacton." It contained upwards of thirty species and is given in another part of this issue. When the editor was a botanizing youngster, a copy of this list fell into his hands and set him off on a new quest which resulted in the discovery of other fragrant species. A letter to the author of "Pepacton" on the subject brought a reply which was, of course, highly treasured by the recipient. With the exception of Burroughs' list, however, there does not seem to have been an attempt made to list our fragrant flowers. Nor does the Old World seem to have made any more progress. It is therefore suggested that the second subject to be considered by the new society for Plant Study should be the making of a complete list of our fragrant wildflowers, including the color of the blossoms. Nobody at present knows how many kinds we have, what part of the country has the greatest number, or what plant family is distinguished in this respect. In such a list we would include all naturalized foreign plants, but not those cultivated in gardens only. The dame's violet (*Hesperis matronalis*), a very fragrant crucifer, would therefore be included, but its foreign origin should be noted. We also suggest a list of those with a distinctly repellant odor, such as the carrion flower (*Smilax herbacea*). Our list can only be repre-

sentative if we have many contributions from widely separated localities. All persons interested are invited to send us notes on this subject in time for the next issue. Further notes on the most fragrant wildflowers are also desired.

Another list which offers the opportunity for an interesting exercise of one's botanical knowledge is that of the fleshy fruits that are borne on herbaceous plants. As most of our readers know, the great majority of fleshy fruits are borne on woody species. Just why this is so appears to be connected with the evolution of plants in general. A complete list of these herbaceous species that bear fleshy fruits, however, whether wild or cultivated, will be a decided addition to our knowledge of the subject. Mention of some species of this kind may be found in this magazine for 1915 on page 32, and for 1916 on page 150. The list is not likely to be a long one, but its making is likely to bring several surprises.

BOOKS AND WRITERS

Science, the official organ of the great American Association for the Advancement of Science, feeling the pinch of advancing prices, has reduced the number of pages in each issue in order to avoid an increase in its rate of subscription. *The American Journal of Botany,* however, announces an advance from $3 to $5 a year and the *Garden Magazine* has advanced from $1.50 to $2. The subscription price of the strictly botanical magazines in this country is now as follows: *American Botanist* $1.25, *American Journal of Botany* $5, *Botanical Gazette* $7, *Bryologist* $1.25, *Fern Journal* 90 cents, *Mycologia* $3, *Plant World* $2.50, *Rhodora* $1.50, *Torreya* $1, *Torry Bulletin* $3. The subscription price, however, is not

the first or best criterion of a magazine. Subject matter, type area, and number of pages are of more importance. When these are considered, *The American Botanist* at the special rate, is absolutely the cheapest magazine of its kind in the world.

A new edition—the 18th—of L. H. Bailey's "Pruning Manual" has recently appeared. This latest edition has been revised and reset and therefore brings the practice of pruning up to date. It is probably safe to say that the more ignorant the man the less essential do proper methods of pruning seem to be. The old maxims "Prune when the knife is sharp" and "Any day but Sunday" are still good enough for him. Much progress in the art of pruning has been made since the first edition of the "Pruning Manual" was issued. There are some kinds of plants that need no trimming at all; others must be pruned in spring and still others in autumn. One must know how, to be successful. The reviewer knows of one public park whose spring show of flowers was ruined for several years by an ignorant gardener whose sole idea in pruning was to produce what Bailey calls "tailored" bushes and trees. In practically all books on gardening, the fundamentals of pruning are discussed, but the "Pruning Manual" is so encyclopedic that it can scarcely be omitted from the library of one who would be fully informed on the subject. The new edition contains more than 400 pages and nearly as many illustrations. It is published by the Macmillan Company, New York, at $2.00.

"From earliest childhood the forest is a place of interest It is first known as the mysterious haunt of some good fairy or good elf. Then it becomes a playground for youth; the

scene of many vigorous rompings by the boys and of not a few of the quieter pastimes of the girls. Later it furnishes the shaded resort for picnics and excursions. It is a place preferred above all others by the devotees of gun and rod. To students of Nature and others of a thoughtful turn of mind, it is the sequestered retreat wherein is the atmosphere of inspiration to lofty purpose and high ideals. The charm of the forest is not confined to any particular rank or body of people. The magnificence and splendor of its natural growth, the peace and quietness of its dusky recesses, the sights and sounds or its wild life—all have their irresistable appeal, not only to the keen student and ardent frequenter, but to the casual and chance visitor as well." Thus begins the preface of J. Gorden Dorrance's "Story of the Forest", which every child who is really alive should find interesting. The sawmill, the logging camp, the charcoal pit, the paper mill, the log drive, the sugar bush, the turpentine orchard, the distribution of forests, the individual forest, the life and death of the tree, the uses of woods and the trees from which lumber is derived and many other phases are all attractively discussed in untechnical language. Even adults will find the book interesting, especially if their early days have been spent in forested regions. The book is published by The American Book Company, New York.

Vol. 23. No. 2 **Whole Number 113**

THE AMERICAN BOTANIST

MAY, 1917

35 Cents a Copy; $1.25 a Year

WILLARD N. CLUTE & CO.

JOLIET, ILLINOIS

The American Botanist

A Quarterly Journal of Economic & Ecological Botany

WILLARD N. CLUTE, EDITOR

SUBSCRIPTIONS.—The subscription price of this magazine is $1.25 a year or $2.00 for two years, payable strictly in advance. The magazine is not sent after subscriptions expire. Personal checks on small or distant banks must contain ten cents for collection fees. The magazine is issued on the 20th of February, May, August and November.

BACK NUMBERS.—Volumes 1 to 10 inclusive consists of 6 numbers each, Vols. 11 to 13 of 5 numbers each and all later volumes of 4 numbers each. The first 18 volumes may be had for 75 cents a volume, or the set will be sent for $9.00. The next 4 volumes $1.00 each or the set for $3.25. A full set contains 2968 pages.

THE FERN BULLETIN

In 1913, at the completion of its twentieth volume, **The Fern Bulletin** was consolidated with this magazine. The back volumes average more than 100 pages each, and since they cover the entire formative period of American Fern study they are invaluable for reference. The majority of new forms discovered in recent years have been described in its pages. First six volumes out of print. A set of vols. 7 to 20 will be sent for $8.00. An extended description of the contents of the volumes may be had for the asking.

WILLARD N. CLUTE & CO., PUBLISHERS

207 WHITLEY AVENUE, JOLIET, ILL.

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The Great Water Lily—*Victoria regia.*

THE AMERICAN BOTANIST

VOL. XXIII JOLIET, ILL., MAY, 1917 No. 2

A thousand tints of misty green
Within the vernal groves are seen
Where snowy dogwood blossoms star
The deepening shadows, while afar
The redbud flushes copse and glade
With burgeoning summer's accolade.

THE GREAT WATER LILY

By Willard N. Clute.

PROBABLY the most gigantic leaves in the world are those of the great water lily, *Victoria regia,* which grows in the quiet waters of northern Brazil and Guiana. Paul Marcoy, an early traveller claims to have measured some that were more than twenty-four feet in circumference. In temperate regions, where the plant may be grown in warm pools, the leaves are much smaller, but even then may reach a diameter of three or four feet. An interesting peculiarity about them is the fact that the edges are turned up for several inches all around, the leaves thus presenting the appearance of large shallow pans. The turned up edges serve a practical purpose and keep the upper surface of the leaf from getting wet.

Although old leaves are, as so frequently pictured, quite circular, the first leaves are narrow and elongated, the next are heart-shaped like ordinary water lily leaves and only the older ones are peltate with the petiole in the center. Even in the old leaves a distinct line shows where the lobes of the leaves

have been joined. Leaves of this kind are strong enough to sustain the weight of good sized children. In their tropical home the great leaves form an almost impassible barrier to navigation. Tropical birds are said to wander over them in large companies searching for food.

The flowers, in keeping with the size of the leaves, are often more than four feet in circumference. Usually they are somewhat smaller but blossoms with a diameter of a foot are common. The plant rarely flowers in the temperate zone, but may be induced to do so by keeping it at the proper temperature. It appears to have first flowered outside of the tropics at Philadelphia. The blossoms are like those of the common water lily in shape. Outside they are pure white and shade to a deep pink within.

The group to which *Victoria regia* belongs is not a large one, but it contains a number of interesting plants. The American lotus (*Nelumbium luteum*) has much in common with its relative of the Amazon. Like it, the leaves are circular with the petiole in the center and the flowers are often as large as a quart bowl. The pink species so often cultivated in parks is the Egyptian lotus (*N. speciosum*) the only other member of the genus.

The water lily family (*Nymphacaceae*) has always been something of a puzzle to botanists. It is ordinarily regarded as a dicotyledon, but some, on account of the structure of the plants, favor tranferring to the monocotyledons. In most books it holds a place low in the scale being assigned to the order Ranales which includes, besides the type family Ranunculaceae, the Magnoliaceae, the Berberidaceae, the Calycanthaceae and several others. A more than passing resemblance may be found in the blossoms of the whole group. This is especially striking in the flowers of the peony, the mandrake, the magnolia, and the calycanthus.

A NEW PLANT ADDED TO OUR WILD FLORA

By Albert A. Hansen.

DURING the past five years, the writer has noticed a pretty little blue-flowered plant making itself at home upon the campus of the Pennsylvania State College. At first rather scarce, it gradually increased, spreading thruout the town and becoming abundant in waste places and along roadsides. Recently it has extended its territory along the roadways outside the town proper. From the few scattered individuals of a few years ago, the plant has now become one of the most prolific members of the local flora.

Upon investigation, the newcomer was found to be the Siberian crane's-bill, known scientifically as *Geranium sibiricum* and is a close relative of the common wild geranium or crane's-bill (*G. maculatum*). In general appearance, it is very suggestive of the Herb Robert, (*G. Robertianum*). The Siberian crane's-bill is usually a prostrate plant with three-parted leaves somewhat resembling those of a buttercup. The flowers are about a quarter of an inch in diameter, and possess five bluish-purple or nearly white petals. The flowers occur rather abundantly and present a handsome appearance.

The fruit is extremely interesting; when ripe, the five parts act like tiny sling shots. By dipping one of the nearly ripe fruits into water and allowing it to dry, you may see how the plant acts. When the fruit becomes thoroughly dry, each of its five parts is released with a snapping noise like that of a tiny gun, and the seeds often are thrown to considerable distances. The sling-shot part of the fruit then curls into a small spiral, so

that when the job of seed dispersal has been completely accomplished, the remaining portion of the fruit consists of a central column crowned with five tiny spirals.

Authorities on the distribution of plants in the United States assert that the Siberian crane's-bill occurs in but two other localities in this country. It is frequent on Manhattan Island, New York, being especially common along the roadsides on the outskirts of New York City, and has also been reported from California. How it came to State College is a mystery to the writer, though it could have been brought in a variety of ways. It is possible that someone, taking a fancy to the pretty little plant found growing wild in New York, brought some seeds to State College with the intentions of cultivating it and that the plant escaped from cultivation. It is even possible that a single seed might have been cast upon the clothes of a passerby, a feat readily accomplished by the explosive action of the fruits. This single seed would be sufficient to start the plant in State College. It is a known fact that exhibitions and other gathering places where people assemble from all corners of the earth are frequently followed by epidemics of new weeds brought in from foreign countries. The seeds which start these new plants are usually introduced on the clothes of visitors. Russian Thistle is said to have been introduced into this country in that way.

The original home of the Siberian Crane's-bill is Asia. It will be of great interest to watch for the future spread of this new arrival on our hospitable shores, since the plant now appears to be well established and spreading. Another feature which adds interest, is the possibilities which the plant offers as a weed, suggested by the rather heavy and persistant root and the rapidity of its spread.

A WHITE CYPRIPEDIUM ACAULE

By Charles MacNamara.

THE genus *Cypripedium* undoubtedly furnishes the finest orchid blossoms of Eastern North America, and in beauty of form and richness of coloring they challenge comparison with any of the exotics of the same genus. But strange to say, none of our native Lady's slippers figure in the dealers' catalogues, and very few fanciers seem to grow them. It is not easy to understand this neglect, but probably it is due to the small store we set on familiar things. If it were necessary

to undertake expensive and dangerous expeditions into the Amazonian wilds in order to obtain the showy Lady's slipper (*C. hirsutum*), the flower would doubtless be a prized and honored inmate of every orchid house. But as it can be procured at no more trouble than a walk of a mile or two to the nearest wooded swamp, and with no more risk than a few mosquito bites, this noble bloom is left to blush unseen in its native mossy haunts.

The showy Lady's slipper is certainly the largest and handsomest flower of the genus, but the stemless Lady's slipper (*C. acaule*) is a good second. One day in June, in a pine wood on the banks of the Ottawa River in Eastern Ontario, I came on some plants of this species growing among the juniper bushes, bracken, and sarsaparilla that formed the sparse underbrush. There were about a dozen vigorous plants, all in bloom, scattered over an area of five or six hundred square feet. The blossoms exhibited a considerable color variation, the labellums of some being tinted and lined with the rich rose, or pink characteristic of the species, while others were decidedly pale, and almost anaemic in appearance. Searching farther, to my delight I came on a specimen of that rarity, a pure white *C. acaule* with pale greenish-yellow petals. It was a fine well-grown plant, and the beautiful translucent blossom hung in its dark green setting like a tiny opalescent lantern. It was the shrine to which I made numerous pilgrimages that summer, but it failed to attract the bee necessary for its polination, for it did not set seed. The next year the lovely blossom appeared again, and I managed to photograph it as it grew. The monochrome rendering of the camera lacks, of course, the subtile delicate tints of the original, but I am glad that I secured even this poor record of the flower, for shortly after, a falling tree destroyed the plant, and I have since sought in vain for another like it.

OUR FRAGRANT WILDFLOWERS

NEARLY two hundred fragrant wildflowers scattered through more than sixty plant families have been brought to light as a result of our inquiry into the matter, and still the list appears to be far from complete. This preliminary list, however, will serve as an outline to which other species may be added until such time as a fairly complete list is possible. It is not likely that further additions will greatly change the relative number of fragrant species in the different plant families and we are thus warranted in considering the heath, lily, orchid and rose families as the leaders in fragrance. When all the observations are in, it is possible some of the species now listed will have to be dropped because not entirely conforming to our definition of fragrance. The writer would scarcely include *Ilex opaca* among fragrant wildflowers, though it may be possible that this species varies with the locality or even with the seasons in the amount of fragrance it possesses. It is hoped that all interested will scan the list closely and give their opinions on this and other disputed points. Information regarding *Trillium sessile* reported as fragrant is especially solicited. This plant is very familiar to the writer but he has never discovered any fragrance in it. Can the difference be due to the locality?

One of the surprising features of the list is the number of white flowers recorded as fragrant. Nearly half of the species included are of this color. Even when allowance is made for the larger number of white flowers in our flora, the disproportionate number of fragrant white flowers is still very striking. In this magazine for March 1905 (Vol. 8 p. 41),

John Lovell gives a summary of the flower colors in Northeastern America from which we learn that, of insect-pollinated flowers, 955 are white, 790 are yellow, 257 red, 422 purple, and 325 blue. A similar ratio undoubtedly holds good for other parts of the country, but our list of fragrant species shows more than 80 that are white against less than 25 that are yellow, 45 pink (purple and red), and only 10 blue. What it is that causes so many white flowers to be fragrant is a subject for much ingenious speculation. It is known that white flowers are most abundant in spring, but that fragrance is not essential to successful existence is seen in the large number of flowers of this color which are not fragrant. Concerning this latter subject, however, it may be suggested that it is quite possible that all flowers may be fragrant to the bee. It is no sign that flowers have no odors just because our blundering sense of smell cannot detect any. Experiments bearing on this phase of the matter are very much desired. Blue flowers are said to be most pleasing to bees and it is possible that the possession of favorable color enables blue flowers to dispense with perfume, but here again, fragrance may be present and our nose fail to detect it.

Much interest naturally centers in those plants which have been suggested for inclusion in the list but which for one reason or another have been retained on the waiting list as it were. Possibly some already admitted should be transferred to this list. Many of these are undoubtedly odorous, but if we define fragrance as a pleasing odor, then many of them are certainly not fragrant. Several observers have mentioned the hawthorns (*Crataegus*)as fragrant, but it may be questioned whether any of the species are really so. The same may be said of the various wild cherries. In a somewhat similar class should doubtless be placed the golden-rod and other species which have, as one observer expressed it, "a sort of yellow smell." Many of the mints also have aromatic foliage,

but does anybody know of a mint with really fragrant flowers? More observations are desired in regard to flowers that are occasionally fragrant, such as the hepatica and spring beauty are said to be, as well as other species which are fragrant for only part of each day, as the evening primrose and four o'clock. These latter however may be classed as truly fragrant.

Among the species suggested as fragrant but held for further observation are *Cornus florida, Viola lancifolia, V. primulaefolia, V. pedunculata, Kalmia latifolia, Eupatorium purpureum, Pontederia cordata, Pyrus arbutifolia, Amelanchier Canadensis, Smilicina trifoliata, Solidago odorata, Monarda didyma, Collinsia verna, Lobelia cardinalis, Amorpha Texana, Amsonia Texana, Verbena bipinnatifida, Carduus altissimus, Conoclinum coelestinum, Camassia Fraseri, Erodium moschatum, Mertensia Virginica, Rubus odoratus, R. strigosus Spiraea salicifolia, S.tomentosa, Clematis Virginca, Galium triflorum, Monotropa uniflora, Asclepias tuberosa, Rhus glabra, Anemone quinquefolia* and *Diervilla trifida.* The failure to admit these to the list is no reflection on the preceptions of the persons reporting them, but the writer, whose nose is fairly keen for plant odors, has failed to find any trace of fragrance in them. The question now arises, are these fragrant in other localities or are only certain specimens odoriferous? Further observations regarding these are especially desired.

Among the larger lists received was one of 67 species from J. W. Stacey, San Francisco, 69 from Mrs A. E. Scoullar, Standish, Maine, 67 from Mr. and Mrs. F. G. Kenesson, Lyman, Miss., 52 from Henry A. Lynk, Waterloo, Ind., 37 from C. L. Gruber, Kutztown, Pa., 51 from Chas. C. Plitt, Baltimore, 51 from Mrs. G. T. Drennan, New Orleans, and 58 from Mrs. J. D. Tuttle, Marlboro, N. H. Smaller lists have been received from many others who will find their species reported in the list. Only native plants, so far as known, have

been listed. Another and more complete list will be given later as well as a list of fragrant naturalized species. Much material has already been sent in for the list of ill-scented wild-flowers but much more is desired.

LIST OF SPECIES.

ALISMACEAE

Arrowhead (*Sagittaria latifolia*). White.

LILIACEAE.

Lemon lily (*Lilium Parryi*). Yellow.
Chaparral lily (*Lilium rubescens*). Pink.
Washington lily (*Lilium Washingtonianum*). White.
Carolina lily (*Lilium Carolinianum*). Red.
Reed lily (*Hastingsia alba*). White.
Desert lily (*Hesperocallis undulata*). White.
Lily of the Valley (*Convallaria majalis*). White.
White adder's tongue (*Erythronium album*). White.
Sessile trillium (*Trillium sessile giganteum*). Pink.
Painted trillium (*Trillium undulatum*). White.
Nodding trillium (*Trillium cernuum*). White.
Bellwort (*Uvularia perfoliata*). Yellow.
Devil's bit (*Chamaelirium luteum*). Whitish.
Fly poison (*Amianthium muscaetoxicum*). White.
Swamp Pink (*Helonias bullata*). Pink.
Bunch flower (*Melanthium Virginicum*). Cream.
Coast smilax (*Smilax auriculata*). White.
Bear grass (*Xerophyllum tenax*). White.

AMARYLLIDACEAE.

Spider lily (*Hymenocallis occidentalis*). White.
St. John's lily (*Crinum Americanum*). White.
Prairie lily (*Cooperia pedunculata*). White.

IRIDACEAE.

Ground iris (*Iris macrosiphon*). Blue.
Early iris (*Iris verna*). Blue.

ORCHIDACEAE.

Yellow lady's slipper (*Cypripedium parviflorum*). Yellow.
Purple lady's slipper (*Cypripedium acaule*). Pink.
Montana lady's slipper (*Cypripedium Montanum*). Pink.
Showy orchis (*Orchis spectabilis*). Pink.
Arethusa (*Arethusa bulbosa*). Pink.
Pogonia (*Pogonia ophioglossoides*) Pink.
Calopogon (*Calopogon pulchellus*). Pink.
Purple fringed orchis (*Habenaria psycodes*). Pink.
White fringed orchis (*Habenaria blephariglottis*). White.
White bog orchis (*Habenaria nivea*). White.
White bog orchis (*Habenaria dilatata*). White.
Wood rein orchis (*Habenaria elegans*). White.
Sierra rein orchis (*Habenaria leucostachys*). White.
Lady's tresses (*Spiranthes cernua*). White.
Lady's tresses (*Spiranthes odorata*). White.
Rattlesnake plantain (*Epipactis pubescens*). White.

PIPERACEAE.

Lizard's tail (*Saururus cernuus*). White.

FAGACEAE.

Chestnut (*Castanea dentata*). Cream.

POLYGONACEAE.

Butter balls (*Eriogonum compositum*). Yellow.
Alpine smartweed (*Bistorta bistortoides*). White.

NYCTAGINACEAE.

Pink Sand verbena (*Abronia villosa*). Pink.
Yellow sand verbena (*Abronia latifolia*). Yellow.

AIZOACEAE.

Sea fig (*Mesembryamthemum aequilaterale*). Pink

NYMPHAEACEAE.

White water lily (*Castalia odorata*). White.
Pond lily (*Nymphaea advena*). Yellow.
American lotus (*Nelumbium luteum*). Yellow.

RANUNCULACEAE.

Marsh clematis (*Clematis crispa*). Bluish.
Virgin's bower (*Clematis Virginiana*). White.
Wild peony (*Paeonia Brownii*). Red.
White baneberry (*Actaea alba*). White.
New Mexico larkspur (*Delphinium Novo-Mexicanum*). Blue.

MAGNOLIACEAE.

Sweet bay (*Magnolia Virginiana*). White.
Big magnolia (*Magnolia macrophylla*). White.

CALYCANTHACEAE.

Sweet Shrub (*Calycanthus Floridus*). Brownish.
Western sweet shrub (*Calycanthus occidentalis*). Brownish.

BERBERIDACEAE.

Oregon grape (*Berberis repens*). White.
Barberry (*Barberis haematocarpus*). Yellow.
Mandrake (*Podophyllum peltatum*). White.

PAPAVERACEAE.

Matilija poppy (*Romneya Coulteri*). White.

FUMARIACEAE.

Squirrel corn (*Dicentra Canadensis*). White.

CRUCIFERAE.

Western wall flower (*Cheirinia aspera*). Yellow.

SARRACENIACEAE.

Pitcher plant (*Sarracenia purpurea*). Red.

CRASSULACEAE.

Yosemite stonecrop (*Sedum Yosemitense*). Yellow.

SAXIFRAGACEAE.

Modesty (*Whipplea modesta*). White.
Boykinia (*Boykinia major*). White.
Incense shrub (*Ribes glutinosum*). Pink.
Golden currant (*Ribes aureum*). Yellow.
Sierra currant (*Ribes Nevadense*). Pink.

Small leaved syringa (*Philadelphus microphyllus*). White.
Lewis' syringa (*Philadelphus Lewisii*). White.

HAMAMELIDACEAE.

Witch hazel (*Hamamelis Virginiana*). Yellow.

ROSACEAE.

Carolina rose (*Rosa carolina*). Pink.
Shining wild rose (*Rosa Virginiana*). Pink.
Smooth wild rose (*Rosa blanda*). Pink.
California wild rose (*Rosa Californica*). Pink.
Cliff rose (*Cowania Stansburya*). Yellow.
Islay (*Prunus ilicifolia*). White.
California meadowsweet (*Sericotheca Franciscana*). White.
Hardhack (*Cerocarpus Douglassi*). Pink.
Fern bush (*Chamaebatiaria millefolium*). White.
Oso berry (*Osmaronia cerasiformis*). White.
Christmas berry (*Heteromeles salicifolia*). White.
Thimble berry (*Rubus parviflorum*). White.
Wild crab (*Pyrus arbutifolia*). Pink.
Iowa wild crab (*Pyrus Ioensis*). Pink.

LEGUMINOSAE.

Black locust (*Robinia pseudacacia*). White.
Butterfly pea (*Clitoria Mariana*). Blue.
Wisteria (*Wisteria Macrostachya*). Blue.
Tree lupine (*Lupinus arboreus*). Yellow.
Bicolored lupine (*Lupinus stiversii*). Yellow and Pink.
Sensitive brier (*Schrankia uncinata*). Pink.
Ground nut (*Apious Tuberosa*). Brown.

RUTACEAE.

Hercules' club (*Fagara Clava Herculis*). White.

EUPHORBIACEAE.

Tread softly (*Jatropha stimulosa*). White.

ANACARDIACEAE.

Varnish sumach (*Rhus copallina*). Greenish.

CYRILLACEAE.

Buckwheat tree (*Cliftonia monophylla*). White.

AQUIFOLIACEAE.

Holly (*Ilex opaca*). White.

STAPHYLEACEAE.

Bladder nut (*Staphylea trifolia*). White

ACERACEAE.

Striped maple (*Acer Pennsylvanicum*). Greenish.
Red maple (*Acer rubrum*). Red.
Sugar maple (*Acer saccharum*). Greenish.

RHAMNACEAE.

Snow brush (*Ceanothus velutinus*). White.
Deer brush (*Ceanothus integerrimus*). White.
California lilac (*Ceanothus thyrsiflorus*). Blue.

VITACEAE.

Frost grape (*Vitis cordifolia*). Greenish.
Fox grape (*Vitis labrusca*). Greenish.
California wild grape (*Vitis Californica*). Whitish.

TILIACEAE.

Basswood (*Tilia Americana*). Yellowish.
Southern Basswood (*Tilia Michauxii*). Greenish.

MALVACEAE.

False mallow (*Malvastrum Thurberi*). Pink.
False mallow (*Malvastrum Fremonti*). Pink.

TERNSTROMIACEAE.

Loblolly bay (*Gordonia lasiantha*). White.

VIOLACEAE.

White violet (*Viola blanda*). White.
Canada violet (*Viola Canadensis*). Blue.

PASSIFLORACEAE.

May-pop (*Passiflora incarnata*). Blue.

LOASACEAE.

Mentzelia (*Mentzelia odorata*). Pink.

CACTACEAE.

Hedgehog cactus (*Echinòcereus Fendleri*). Red.

ONAGRACEAE.

Evening primrose (*Oenothera biennis*). Yellow

ARALIACEAE.

Ground nut (*Panax trifolia*). White.

ERICACEAE.

Pinkster (*Azalea nudiflora*). Pink.
Tree azalea (*Azalea arborescens*). Pink.
Swamp honeysuckle (*Azalea viscosa*). White.
Yellow azalea (*Azalea calendulacea*). Yellow.
Western azalea (*Azalea occidentalis*). Pink.
Manzanita (*Arctostaphylos uva-ursi*). White.
Salal (*Gaultheria shallon*). Pinkish.
Red heather (*Phyllodoce Breweri*). Pink.
Fetter bush (*Lyonia nitida*). White.
Princess pine (*Chimaphila umbellata*). White.
Spotted wintergreen (*Chimaphila maculata*). White.
Pipsissewa (*Chimaphila menziesii*). White.
Shin leaf (*Pyrola asarifolia*). White.
False wintergreen (*Pyrola rotundifolia*). White.
Sweet pinesap (*Monotropsis odorata*). White.
Pinesap (*Monotropa hypopitys*). Pinkish.
Leucothoe (*Leucothoe racemosa*). White.
Sourwood (*Oxydendron arboreum*). White.
White alder (*Clethra alnifolia*). White.
Deer berry (*Vaccimium stamineum*). Greenish.
Trailing arbutus (*Epigaea repens*). Pink.

PRIMULACEAE.

Cowslip (*Dodecatheon Clevelandii*). Pinkish.
Loosestrife (*Lysimachia ciliata*). Yellow.

STYRACACEAE.

Sweet leaf (*Symplocos tinctoria*). White.
Storax (*Styrax grandifolia*). White.

OLEACEAE.

White fringe (*Chionanthus Virginca*). White.
Sweet olive (*Osmanthus Americanus*). White.

LOGANIACEAE.

Yellow Jasmine (*Gelsemium sempervirens*). Yellow.

GENTIANACEAE.

Sabbatia (*Sabbatia angularis*). Pink.

APOCYNACEAE.

Dogbane (*Apocynum androsaemifolium*). White.

ASCLEPIADACEAE.

Common milkweed (*Asclepias syriacus*). Pink.
Four leaved milkweed (*Asclepias quadrifolia*). White.

POLEMONIACEAE.

Sweet william (*Phlox divaricata*). Blue.
Alpine Phlox (*Phlox Douglassii*). Lilac.
Small prickly gilia (*Gilia pungens*). White.
Large prickly gilia (*Gilia Californica*). Pink.

BORAGINACEAE.

Bluebells (*Mertensia alpina*). Blue.
Popcorn flower (*Plagiobothrys nothofulvus*). White.

SOLANACEAE.

Purple nightshade (*Solanum Xanti*). Purple.

SCROPHULARIACEAE.

Popcorn beauty (*Orthocarpus versicolor*). White.
Elephant's head (*Pedicularia Groenlandica*). Pink.

LENTIBULARIACEAE.

Bladderwort (*Utricularia cornuta*). Yellow.

BIGNONIACEAE.

Catalpa (*Catalpa speciosa*). White.

MARTYNIACEAE.

Unicorn plant (*Martynia Louisiana*). Pinkish.

RUBIACEAE.

Partridge berry (*Mitchella repens*). White.
Button bush (*Cephalanthus occidentalis*). White.
Northern bedstraw (*Galium boreale*). White.

CAPRIFOLIACEAE.

Twin flower (*Linnaea borealis*). White.
Elder (*Sambucus Canadensis*). White.

CUCURBITACEAE.

Balsam root (*Balsamorhiza sagittata*). Yellow.

COMPOSITAE.

Pasture thistle (*Cirsium pumilum*). Pink.
Cone flower (*Lepachys columnaris*). Yellow.
Climbing boneset (*Mikania scandens*). White.
Sweet Colt's foot (*Petasites palmatus*). Pink.
Centaurea (*Centaurea Americana*). Pink.

A NEW OXYTROPIS FOR NEBRASKA

OXYTROPIS LAMBERTI TENUIFOLIA.

BY J. M. BATES.

ON June 5, 1915, Prof. Gilmore of the State University collected at Thurston, in northeastern Nebraska, a unique form of *Oxytropis* to which I would call attention. The whole plant is green with thin strigose pubescence except the calyx which is densely canescent. The stems rise from a stout caudex and are a foot high. The leaves range up to 19 centimeters long and are very strict, and the leaflets are from 15 to 19 in number, from 20 to 40 millimeters long, and 1or 2 millimeters wide. The spikes are 13 centimeters long, 17 flowered, with the bracts subequal to the calyx or much longer. In the species they are much shorter. The calyx lobes are longer and narrower and the flowers are blue. It is a strikingly different form from anything I have seen in Nebraska and Wyoming and deserves a varietal name.

INDIAN PIPES

By Mrs. Mary Earle Hardy.

WISE ones assume to know how certain flowers come by their complexions, their perfume, their habits, and their habitats, but there are myriads whose life stories wonderment only guesses and no man knows. I recently came upon a group of such flowers, the Indian pipes (*Monotropa*). They seemed the very prototypes of silence and stood like little decorated interrogation points on a page of one of Nature's story books. Science tells us many strange facts about these *Monotropas,* but these do not touch on the heart of the matter, nor let us into the secret of their being. They give us no hint of why these plants have taken such quaint and graceful shapes and have chosen to bring such whiteness into our sun-loving world of color.

These snow-white blossoms or "ghost flowers" seem weird escapes from spirit gardens. They haunt only darkly shadowed forests and stand with bowed heads in deepest solitudes. Though solitary flowered, they usually grow in groups and are half hidden among the leaves and tufted mosses of deep and loamy woodlands. They attract, they repel, they fascinate, they awe.

The whole plant which is from three to ten inches in height is white as the whitest snow except that sometimes the youngest blossoms have the faintest touch of baby pink. The waxen clamminess of the entire plant brings shivers

to the supersensitive who regard it as uncanny and call it "corpse plant." The shape of the blossoms is like exquisitely carved pipes, hence their other name, "indian pipes."

Only one species is known—*Monotropa uniflora,* but this has travelled much. The plants have made settlements in both hemispheres. We find them in the northern

woods throughout the North American continent, they stand together in white-clad groups in far Japan and though so frail and delicate, they are, in Asia, undaunted little Humboldts climbing the Himalayas and living in the seclusion of the mountain solitudes.

What appear to be leaves about the smooth and waxy stems of the plant are properly but scattered scales or

bracts. The calyx is two to four parted in irregular bract-like scales. Its petals are five, sometimes six, and its stamens twice as many. The capsule is a dainty urn holding numerous tiny seeds.

The whole plant is such an exquisite little wonder that when I have come upon it in the shadows of deep woods with last year's brown leaves about its feet, a trifle lifted, it has seemed to be a little ghost of last summer's blossom that for love of the world has parted the brown leaf-portal of its tomb and arisen and lingers still, loath to leave its old haunts.

The *Monotropa* is a saprophyte drawing its beautiful life from decaying vegetable matter. Its whiteness is due to the lack of chlorophyll and lacking this, it is unable to make the starch which all plants need. To its help has come a little thallophyte so fine as to have gone undiscovered until the miscroscope found it. Together they work, the thallophyte securing food for both and the *Monotropa* paying it back in some other kind of plant money.

The little ghosts come out of the earth with their heads bowed and stand thus through all their white lives. At touch of mortal fingers, be it ever so gently, they turn black. When their morning of life is over and their fruit is set, then the little heads are raised proudly, confidently, praisefully. Soon after, the plant grows black and sinks into the mold from whence it came. The plant's scheduled time for flowering is from July to August, but I have found them on our northern borders in October.

A STRAY PLANT FROM ASIA

By James M. Bates.

ON April 24, 1914, I observed a deep violet patch of bloom in the unoccupied spaces of an alfalfa field in Arcadia Valley County, Nebraska. Close inspection showed a crucifer with very small flowers and pods already grown much resembling *Brassica*. It was plainly a winter annual--a habit very common in this family. Search in all botanies accessible to me, including European works in the State University failed to disclose its identity and first class botanists to whom I sent it also failed to throw any light upon it. At last, after bringing a lot of plants to Red Cloud for growth and getting abundant seed, I learn from Dr. Small of the New York Botanical Garden that they have located it as *Chorispora tenella* from Asia. It was unquestionably introduced in cheap alfalfa seed probably raised in Asia Minor. There were probably a thousand plants in bloom where I found it and last year on March 29th, two were already showing color. Its early blooming gives it a quality of value for lovers of nature. It equals the shepherd's purse and is rather more attractive.

Several years before this was found (1910), I discovered a yellow-flowered crucifer new to the United States in another alfalfa field in Arcadia which I had to send to Washington for identification. This turned out to be *Sisymbrium loselli L.* It is now well established along the roadsides of the village but has not yet got into Britton and Brown though found now on the Atlantic Coast.

I suppose we have no family of plants that make themselves at home in a new country more readily than do the crucifers. *Brassia juncea* was collected near Fremont, Nebraska, in 1915, and I found *Erysimum repandum* in my front yard at Long Pine nineteen years ago, long before it was put into our botanies. *Sisymbrium altissimum* I found in a vacant lot in 1900. These species and many others have all the qualifications of weeds but are just as interesting for study as the more beautiful plants.

OUR NATIONAL COLORS IN FLOWERS

By Bessie L. Putnam.

WHILE nature is lavish with her colors, sometimes combining a great variety in certain species, it is very evident that her palette would never have satisfied Betsy Ross when making her first star spangled banner. We find red and white frequently in combination, and almost always where there is a blue flower there is its counterpart in white; but when we look for the three-fold combination that is another matter. True there are often blue and pink as in hepatica, and garden larkspur; and nature has most beautifully blended them in one, in the opening buds of *Mertensia Virginica*. Yet the pure national combination is strangely lacking.

There may be a few instances in which the manipulations of the skilled florist offer the variations for growing a floral flag, but even these are a very few and require a little allowance for modifications in colors. The only approach of which the writer is aware in nature is that of the lobelias, *L. cardinalis*, *L. syphilitica* and the somewhat rare form of the latter which is pure white. The intense scarlet of the first can scarcely be equalled by any other flower. While the hue of the second varies somewhat, it is frequently of a blue quite deep enough to

render the stray spikes of pure white with which it is not infrequently accompanied as pleasing in contrast as are the white stars on our flag.

Each of these plants will thrive in cultivation if supplied with plenty of moisture, and in these days when patriotism runs high, they may well serve a purpose, rarely if ever approached by any other species, as standard bearers of our loved "red, white and blue".

FRUITING OF THE GRAPE FERN.—The various species of Ophioglossaceae (adder's tongues and grape ferns) have the reputation of occasionally resting for a season. In some cases they have been reported to pass an entire growing season without appearing above the surface of the earth. In this connection, therefore, the behaviour of a specimen of the common grape fern (*Botrychium obliquum*) observed through seven summers by Mrs. A. E. Scoullar is of especial interest. In 1910 the plant was found in fruit and transplanted to its present location. In 1911 it produced two fertile spikes; in 1912 two fertile spikes; in 1913 two fertile spikes; in 1914 a single fertile spike; in 1915 a single fertile spike; in 1916 two sterile fronds and no fruit. Of five other plants of this species under observation for six seasons, three bore fruit annually and two failed to do so for one season.

NOTE *and* COMMENT

Boundaries of our Floras.—As every student of botany is aware, the plant covering of our country may be divided into several distinct floras, and within these floras may be found several lesser floras whose boundaries are determined by soil, moisture and the like. As an illustration, take a peat bog nestling in some hollow in a glacial moraine. There is scarcely a plant that is common to the two adjoining regions. Each is, as it were, a world to itself. Where moraine and bog flora meet, a single step may carry the observer from one entirely distinct floral region to another quite as distinct. Again, where sandstone and limestone regions adjoin, the transition from one flora to another is often most marked. In the course of a few miles there may be an almost complete change in the plants. The existence of still greater groups of plants in which these lesser groups are merged is indicated by our botanical manuals which commonly attempt to cover a natural region of this kind. The numerous manuals covering the Northeastern States are good examples. The limits of any of these natural regions is set by conditions of soil, water elevation and latitude much as similar limits are set to the lesser floras, but the greater groups are seldom as distinctly outlined as these latter. Nevertheless one can say in a general way where one flora leaves off and another begins. Perhaps one may be said to end when less than 25% of its characteristic species can be found. In a region where more than 50% of the plants

were similar to those in the Northeastern States the manuals designed for this latter region would be fairly useful, but if the percentage were lower, two different manuals would have to be used. The fact that Wood's Class-book of Botany, though intended for use in the Northeastern States, contains a large number of the plants of the Gulf States, gave it a popularity which it has long retained. For the borderland between the two regions, it is absolutely the best book that can be obtained. Although there are more students of botany in the Northeastern States than in all the other parts of the country put together, nobody seems to have made an attempt to say where the southern, southwestern and western borders of its flora are located. A subscriber asks for information on this point and we would be glad to have replies from readers who have collected in such regions. How far west is Gray's Manual useful? How far south? How far north is a southern flora more desirable than one designed for the Northern States

Abnormal Flowers.—Probably not a season goes by without supplying an observant botanist with many instances of departures from the normal. Mrs. Nellie G. Masson, Indianapolis, Ind., writes that she has found a specimen of *Phlox divaricata* with a second corolla inside the normal one, and a double specimen of the common buttercup that equals the cultivated ranunculus of the garden. An apple blossom found had green leaflike parts among the white petals of a very double flower, and a blue violet with the two upper petals cleft was noted. The abnormal forms often give us a better insight into Nature's processes than the usual blossoms do and whole books have been written on this subject. All such forms are worth recording.

Death of Dr. Hill.—Rev. Ellsworth Jerome Hill, widely known, especially to students of mosses and ferns, died at his residence in Chicago, January 22, 1917, at the age of 84 years. For half a lifetime, Dr. Hill has botanized in the Northern States and has long been an authority on various critical families of plants. As an aid to his studies he brought together an exceptionally fine botanical library and an herbarium of some 16,000 sheets, the latter now deposited at the University of Illinois. A list of 162 titles comprise his written contributions to botany. Dr. Hill belonged to the old school of botanizing botanists, now nearly passed away, and was as familiar with plants in the field as in the herbarium. His kindly nature and unassuming manners made him a most welcome tramping companion, and though no longer with us, he will not soon be forgotten.

Distinguishing Mushrooms.—Amateur mycophagists are always looking for short cuts to naming the fungi, but these all too frequently prove to be merely short cuts to the cemetery. There is no infallible test by which the edible mushrooms may be distinguished from the poisonous ones. The silver spoon test, the vinegar test, the peeling test, the changing color test all fail when least expected. The only sure way to recognize the fungi is to study them as one would study other plants, until they may be certainly recognized. A recent circular from the National Government helps in this by giving one way for distinguishing the common meadow mushroom from a near relative, the highly poisonous *Amanita* which greatly resembles it. The gills of the mushroom are pink or brown at maturity; those of the *Amanita* are always white. There are, however, edible species of mushrooms with white gills but these may be distinguished from *Amanita*

by the fact that *Amanita* has a sort of cup at its base in which the young plant is enclosed while developing. When the growing plant bursts from the cup, it usually carries flakes of this cup up on its cap. It is well, therefore, to avoid all mushrooms with white gills, especially if they have a cup or volva at base and a scaly cap.

MONSTROSITIES OF TRILLIUM.—The genus trillium seems to be strongly inclined to the production of abnormalities. In the *Ohio Journal of Science,* William H. Watson has brought together a number of references to such abnormal plants, but has overlooked the form mentioned in this magazine for 1916. Judging from this list, the most frequent variation from the normal is an increase in the number of perianth segments. Such multiplication of parts has been recorded for the painted trillium, (*T. Undulatum*), red trillium (*T. erectum*), sessile trillium (*T. sessile*), and recurved trillium (*T. recurvatum*). The number of perianth divisions in such flowers ranges from twelve to twenty, and there is usually a reduction in the number of the stamens and carpels, but not always. Another variation is that in which an extra member appears in each whorl, but this is not surprising when we reflect that the Old World genus *Paris,* also a member of the Trilliaceae, is constructed on the plan of four throughout. Owing to its conspicuous flowers, the great white trillium (*T. grandiflorum*) is very frequently the subject of reported abnormalities. The most remarkable of these is a plant reported from Ohio with no less than thirteen whorls of petals. Flowers with from nine to twenty extra parts seem not uncommon. The relationship that exists between leaves and petals is frequently shown by most of the additional parts being green. When cultivated these abnormal specimens show a tendency to continue their peculiarities. The plant with thirty-nine petals remained constant to this feature for at least ten years.

Duration of Leaves.—So common is the fall of the leaf at the end of the growing season that we often seize upon leaf duration as a convenient character for separating plants into related groups. The coniferous trees are often separated from the broad-leaved trees in this way and the former are called evergreens though not all cone-bearers are evergreen. The larch and the cypress cast their leaves in autumn as most of our broad-leaved trees do. On the other hand such species as the holly, the rhododendron and the magnolia as well as a vast number of others in warm climates, do not cast their leaves at the beginning of winter. Ultimately, however, all leaves are thrown off though some may endure for many years before the event occurs. The championship in matters of this kind belongs, of course, to that curious west African gymnosperm, *Welwitschia mirabilis,* which produces but a single pair of leaves and retains them through life, though it may live for fifty years or more. Coming nearer home, we find that the leaves of even common evergreens may attain a very respectable age. Vinnie A. Pease, who has been investigating this subject, reports in the *American Journal of Botany* that some leaves of *Abies grandis* may live for 14 years, of *Picea Sitchensis* 18 years, *Pseudotsuga taxifolia* 16 years, *Taxus brevifolia* 23 years, and others in like proportions. These, however, are the extremes. The average duration is seldom more than half a dozen years, but even this is a ripe old age when compared with the span of life of most leaves. Among various shrubs studied, *Arctostaphyllos uva-ursi* in extreme cases may hold its leaves for 6 years, *Berberis aquifolia* and *B. nervosa* for 6 and 8 years respectively, *Chimaphila umbellata* 7 years, *Gaultheria shallon* 6 years, *Kalmia polifolia* 3 years, *Ledum Groenlandicum* 5 years, and *Vaccinium ovatum* 7 years. From various indications it is apparent that the plants which grow the slowest retain their leaves the longest.

The Roselle Plant.—Fruits and economic plants indigenous to the Tropics are now as never before attracting the attention of the people of the United States. The Roselle plant, however, has been introduced from the Old World, and is of comparatively recent interest. It thrives best in the subtropical states. It is probably the only plant in cultivation in which the part utilized for food is the calyx. This calyx possesses excellent qualities for the manufacture of jelly and allied products. Preparations made from it closely resemble in color and flavor those made from the cranberry. The plant attains a height of from five to seven feet, and branches profusely. In three weeks from the time of blooming, the calyces are large enough to be picked, and make a jelly of a lighter red color than if allowed to fully mature. This fruit is also used in making sauce, jam, flavoring extracts for soda water fountains, and also for coloring jellies, jams, or similar products as a substitute for coal-tar dyes where a bright red color is desired. To prepare for cooking, the fruit pod is taken between the thumb and forefinger of the left hand, stem end up, cutting off the stem and the basal end of the calyx where the seed pod is united with the calyx, when, with a slight pressure of the fingers holding the pod, the seed pod will be forced out. In India this plant is grown for its fiber, which is used in the manufacture of cordage and coarser textile products. In that country the leaves are sometimes used as a salad and the seeds are supposed to have medical properties. They are also fed to cattle and poultry.—*H. E. Zimmerman, Mt Morris, Ill.*

EDITORIAL

This magazine is probably the only one in America with three classes of subscribers, but this does not mean that we offer a choice of prices. The regular price of the magazine is $1.25 a year and the only way it may be obtained for less is by subscribing for two years or more in advance at the reduced rate. When we last raised the price we were mindful of the support given us by old subscribers and we have consequently not raised the price to them. All who were on our lists on March 15th, last, will be billed at $1.00 a year as long as they remain subscribers. To get on this list at present, one must subscribe for two years in advance and ask to be transferred to it. Those who expressly ask us to continue sending the magazine until it is ordered stopped, may pay during the year whenever it is convenient and so avoid the loss of copies in case their subscription has lapsed. Then there is the "permanent" list at 75 cents a year, no longer open to the public but containing the names of a large number of working botanists who have supported the magazine for a long time, in many cases since the beginning. Names dropped from this list cannot be restored and no newcomers can break into the company. A large number of subscriptions fall due with this number and we would ask subscribers to note the class to which they belong and pay accordingly.

On another page of this issue, Mr. Charles MacNamara in an excellent article on the lady's slipper gives the name *Cypripedium hirsutum* to a certain well known form. Botanists who have not kept up with the styles in this genus; however, will be at a loss to know to what species he refers. In the 6th edition of Gray's Manual and in all other works on botany in common use when that book was issued, the larger yellow lady's slipper was known as *Cypripedium pubescens,* and the showy lady's slipper as *C.spectabilis.* When Brittons Manual appeared, we found the yellow species named *C.hirsutum* while the showy species was rechristened *C. reginae.* Then along came the 7th edition of Gray's and, to go Britton one better, made another complete change of names. In this latest edition the yellow lady's slipper is made a variety of the smaller species (*C. parviflora*) while the showy species has actually fallen heir to the name of *C. hirsutum.* When a writer mentions *Cypripedium hirsutum,* therefore, we have no way of knowing to what species he refers unless he distinctly specifies the color of the flower or gives the date of the book from which the name is quoted. We have often been severely criticised for the stand we take against juggling with plant names, but our position does not seem half as absurd as the actions of the plant namers. Of what use has been the changing of names in the present case? Has the interest in botany been advanced in any way? Is the general public more favorably disposed toward the study by such troublesome changes? Has our knowledge of plant life been extended by this running around in a circle? As a matter of fact the only end attained, and that scarcely worth a thought, is the recognition of "priority". But what does anybody care for priority? Nowhere except in the names of certain living things is this fetish of priority worshipped. If the name jugglers had their way the discovery that Aunt Jane had first applied the name Reginald to little Willie would forever prevent the boys from calling him

Bill. It is a great pity that the general public which has to use the plant names does not refuse entirely to countenance this monkeying with nomenclature. If the name-tinkers must be employed, let them engage in a game of tiddledywinks or take up tatting as a pastime.

* * *

Professor John M. Coulter, Chairman of the Committee on Botany, National Research Council, has prepared a list of suggested investigations by means of which the national welfare may be advanced during these troublous days. Many of these problems can only be taken up by scientists with adequate laboratory facilities, but there is one subject in whose advancement every botanist and botanizer can join and that is a survey of the wild products which may be substituted for more expensive crops. During the Civil War, a southern gentleman, Dr. John Porcher, issued a book in which was listed a large number of the wild plants of the South which could be substituted for much needed drug and food plants. A new list of this kind is much to be desired and since this is exactly in line with the objects of the recently organized Corresponding Botanical Club, we suggest for the next report a list of all such plants known to the correspondents. What plants not ordinarily cultivated do you know of that are edible? What root crops? What fruits or seeds? A great deal of information on these points might be readily obtained from hunters, trappers, woodsmen, farmers, Indians and the foreigners who pick up considerable food from the countryside. This information should be arranged in two groups, one containing such facts as the reporter knows from personal experience to be true, and the other, information which is a matter of hearsay. If this is arranged somewhat after the order of that in the list of Fragrant Wildflowers, it would greatly facilitate

the work of compiling in this office. Another item called for by the Committee is a list of the wild plants that can be used in medicine. Many of the medicinal plants in use at present come from our own fields and woods and there are many more that have real or reputed medicinal properties that might be further investigated. In supplying such lists, we shall not only be advancing our own interests in botany but helping our country as well, and we trust that a very large number of observers will respond. There are no dues or fees of any kind in the Correspondence Club. Anybody interested in the subject which happens to be up for discussion is invited to record his observations.

* * *

The prospect of an extended war has produced a number of nonsensical suggestions for economizing. One of the first in this category is the proposal to do without the productions of the florist until better times return. Those who favor the omission of flowers at weddings, funerals, commencements and similar functions do not stop to consider that the florists not only have an immense amount of capital tied up in their special industries, which cannot be immediately turned to account in other lines, but that the potter, the seed grower and a host of other tradesmen depending upon them for patronage would find their own businesses gone or sadly depressed were the florists to cease operations. To us the proposition to begin a war by wrecking the business of a considerable part of the population does not look attractive. True economy consists in making the best use of a thing, not in going without it. If the country as a whole is to remain prosperous, its citizens must buy about as they have been doing, but they must see that what they purchase is used to its fullest extent. This is no time to cut down on schools, books, magazines or even vacations.

BOOKS AND WRITERS

We cannot call to mind a State University that is doing more for the general public than is the Ohio State University. For a long time there has come to us at frequent intervals a variety of publications on different phases of nature that must be exceedingly helpful to residents of the State—as they certainly are to those in the States adjacent. The latest in the list bears the title "The Grasses of Ohio" by Professor John H. Schaffner. This is apparently part of a more extended work on the flora of the State and is very well done with the exception of the local brand of nomenclature used. There are modern keys to both the genera and species and good descriptions of all the grasses known to inhabit the State. The reviewer would be glad to have a work of similar nature for his own part of the world.

The first number of the *Chicago School Journal*, which is to be devoted principally to the schools of Chicago, has appeared. It is published at 5828 Sawyer Avenue, Chicago. It is apparently to be issued monthly and costs $2.50 a year. The first number of 48 pages is largely taken up with the first installment of an "educational novel."

After working for more than twenty years with the green algae, and allied plants, Prof. G. S. West of the University of Birmingham, England, has issued a volume on "Algae" which forms the first of a series of advanced texts to be known as Cambridge Botanical Handbooks. Other volumes on lichens, fungi, and gnetales are expected to appear soon. The present volume is an extension of the author's "Treatise on British Freshwater Algae" published some time ago and now out of print. It treats of the plants commonly known as the blue-green

and green algae under the divisions Myxophyceae (Cyanophyceae), Peridinieae, Bacillariae, and Chlorophyceae. The bulk of the book is devoted to the last mentioned group whose species are arranged under the divisions Isokontae, Akontae, Stephanokontae, and Heterokontae. The inclusion of the algae in all college and most high school courses in botany renders some knowledge of this group imperative on the part of both student and teacher, and all will therefore be glad to have this authoritative text which goes into the subject rather more fully than other works of a similar nature. Issued after several years of active study of the group by many observers, it contains the latest views on many points at issue. In addition to the strictly scientific account of structures and relationships, the book has much of interest to the general reader. There are over a thousand figures, many of them from original drawings by the author. Mechanically the book is well done, paper, presswork and binding being above criticism. The book which is a large octavo of 475 pages is issued by the Cambridge University Press, England, which is represented on this side of the world by G. P. Putnam's Sons, New York. The price is $6.25.

Now that this country is producing more than 125 million boxes of strawberries annually from no less than 1800 different varieties of the plant with a total value greater than the crop of prunes, pears, or cherries, the need for a book like S. W. Fletcher's "Strawberry Growing" is apparent. From this book we learn that there is no special strawberry region to which growing is restricted, as is the case with some other fruits. Strawberries may be grown anywhere if there is moisture enough, but as a matter of fact the bulk of the crop comes from the Province of Ontario, the Atlantic seaboard south of New York, the Gulf Coast, the Ozark region in Missouri and Arkansas,

and certain parts of California and the Northwest. The industry is likely to spring up anywhere in reach of the large cities. "Strawberry Growing" is much more than a manual for the cultivation of the fruit. It discusses at length packages, picking, packing, marketing, and similar subjects, while in the cultural part of the book, every essential from soil and fertilizers to pollination, mulching, and the selection of the best varieties are considered. There are 24 plates and an equal number of other illustrations in the text. The book contains more than 300 pages and is likely to become a classic in strawberry growing. It is published by Macmillan & Co., New York, at $1.75.

Charles Francis Saunders, an eastern man who has been in California so long that he acts like a native, has issued a little book with the title "Finding the Worth While in California." If anybody knows how to find worth while things in California it ought to be Saunders, for he has wandered up and down the State on many roads camping and tramping in the out-of-the-way places studying the flowers and the birds, the missions, the Indians and the other natives, and sampling the hotels and boarding houses. What he has to say, therefore, is backed up by personal knowledge and made readable by the experience gained in making several other books on his adopted State. The book is published by Robert McBride & Co., New York, and costs a dollar. We are of the opinion that the information it contains will save several times its cost to the tourist, and we imagine it is likely to be found in the packs of all who know about it.

"The Mysteries of the Flowers" is the title selected by Herbert W. Faulkner for an excellent volume on the pollination of flowers. This subject is one that has not been overworked from the popular side—in fact, with the

exception of Knuth's compendious volumes, there does not seem to be anything else on the subject that is readily accessible. In the present volume, all the devices for securing pollination familiar to the investigating student are described and for the most part illustrated by pen-and-ink drawings by the author. There are also eight plates in color. The text is written in a lively style which should appeal to children as well as to others beginning the study, though there is probably a little more emphasis on adaptation and the Darwinian aspect of evolution than the modern ecologist would countenance. This, however, may be overlooked in a book of this kind which aims at being both instructive and entertaining. It ought to have an extensive use in schools. It is published by the F. A. Stokes Co., New York, at $2.00 net.

In these days of ecology, plant breeding, and inquiries into the minute anatomy of plants, that form of publication known as a "local Flora" has almost become extinct though now and then a new one appears to remind us that field botanists are still in the field getting considerable pleasure and healthful exercise out of the search for rare plants in their respective localities. We are moved to these reflections by the appearance of Alfred Twining's "Flora of Northeastern Pennsylvania," an admirable list of 1534 species growing in the Lackawanna and Wyoming valleys, with the localities given in which the rarer ones may be found. The book is published by the Everhart Museum, Scranton, Pa., and is built on an earlier "Flora of the Wyoming and Lackawanna Valleys" by Prof. C. O. Thurston. The new list contains a much larger number of species and Mr. Twining is to be congratulated on the thoroughness of the survey that brought them to light. The region covered is one of much interest to the botanist,

with many all but inaccessible spots in which the rarer species will doubtless long be preserved from extinction. The "Flora" will be an invaluable guide to the plants of a region much wider than the title indicates and will long stand as a monument to the painstaking labor of its maker. The book awakens many pleasant memories in the mind of the reviewer who has visited many of the localities mentioned in the company of the author.

The Controller of His British Majesty's Stationery Office, which has heretofore published the *Kew Bulletin of Miscellaneous Information* has ruled that this publication is not necessary during the war and it has consequently been suspended. We very much regret that this old and important publication has been forced to cease its activities and we trust that the end of the war will see it again in the field. No nation can hope to remain long in the running if it proposes to ignore the advances in botanical science.

Vol. 23. No. 3 Whole Number 114

THE AMERICAN BOTANIST

AUGUST, 1917

35 Cents a Copy; $1.25 a Year

WILLIARD N. CLUTE & CO.
JOLIET, ILLINOIS

The American Botanist

A Quarterly Journal of Economic & Ecological Botany

WILLARD N. CLUTE, EDITOR

SUBSCRIPTIONS.—The subscription price of this magazine is $1.25 a year or $2.00 for two years, payable strictly in advance. The magazine is not sent after subscriptions expire. Personal checks on small or distant banks must contain ten cents for collection fees. The magazine is issued on the 20th of February, May, August and November.

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In 1913, at the completion of its twentieth volume, **The Fern Bulletin** was consolidated with this magazine. The back volumes average more than 100 pages each, and since they cover the entire formative period of American Fern study they are invaluable for reference. The majority of new forms discovered in recent years have been described in its pages. First six volumes out of print. A set of vols. 7 to 20 will be sent for $8.00. An extended description of the contents of the volumes may be had for the asking.

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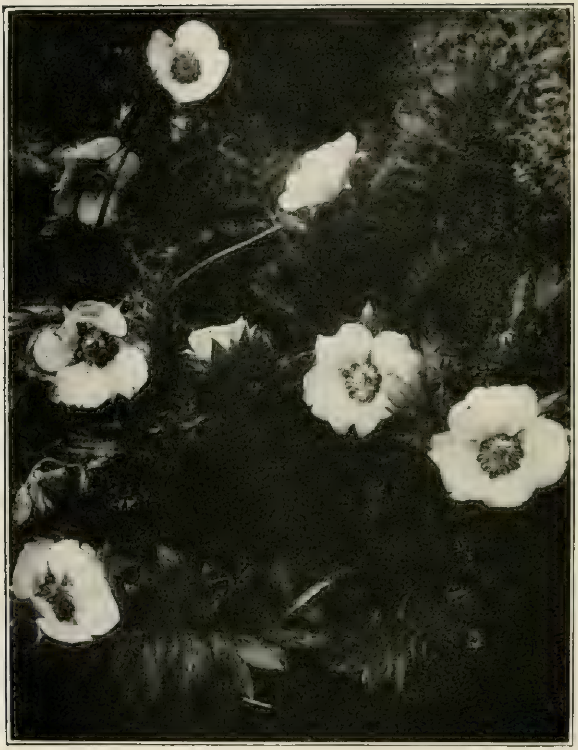

Mountain Avens.—*Sieversia turbinata.*

THE AMERICAN BOTANIST

VOL. XXIII JOLIET, ILL., AUGUST, 1917 No. 3

The deep red cones of the sumach
And the woodbine's crimson sprays
Have bannered the common roadside
For the pageant of passing days.
These are the oracles Nature
Fills with her holy breath,
Giving them glory of color,
Transcending the shadow of death.

—*Bliss Carman.*

PLANT LIFE ON THE PEAKS

By Mrs. Blanche H. Soth.

FROM sea-level in the Arctic regions, timberline gradually ascends until, in the central Rockies, it lines the mountain sides at between 11,000 and 12,000 feet. All the world above this distinct, but natural, boundary belongs to the Arctic-alpine zone of plant life. The climatic conditions are similar in many respects to those of the Arctic regions and the plants that grow there are peculiar to the Arctic lands and to the tops of those mountains that are high enough to tower above the influence of the forests.

The amount of moisture in the soil available for root absorption determines the limit of tree growth. They grow at a higher altitude on the southerly exposed mountain sides than upon the northward facing slopes because the intense sunlight and the prevailing southwest winds melt

the snow more readily and thaw and warm the soil to a greater depth. The thin air of these high altitudes, lacking in moisture and haze of any sort, favors reflection rather than absorption of the sun's heat so that the ground above timberline does not thaw, even in summer, to a depth sufficient to liberate moisture enough to support tree life.

The soil is made up of the detritus from the weathering of the ruddy pinnacles, the sheer faces of the cliffs and the aged, isolated boulders. The frosts and storms of innumerable blustery winters have liberated these granitic particles and whirled them over and over and down, ever grinding them finer. To this rock-waste have been added through countless centuries the products of vegetable decay and the droppings of birds and animals. Thus, there has slowly accumulated a thick blanket of loose, gravelly soil that covers all but the most resistant ridges, the highest, most irregular rock fields and the deepest, sheerest abysses. It smooths many of the lesser spurs into rounded, undulating forms and softens the skylines into gentler angles save where the hardest "rocky ribs" jut through it. Of considerable depth for some distance above the treeline, it supports, a dense growth of grasses and sedges, some shrubby willows and other shrubs and a great variety and brilliant profusion of flowering herbs. It thins out towards the summits and passes into isolated pockets among the rocky outcroppings. The grasses and shrubs disappear and only a few most enduring plants are to be found in the crannies of the highest peaks.

The great majority, probably all, of these high Alpine forms are perennials. They bear seeds and increase in numbers by this means, but they rely upon enduring roots of various forms to perpetuate the individuals. The large number of different plants is a revelation to those who have been taught to regard the mountain peaks as barren wastes of rock. At least 250

species of conspicuous flowering plants and 75 or 80 more of grasses and sedges occur there. Some few are peculiar to the mountains of certain localities but more than half of them are common to all the high mountains of Western North America.

Harebells nodding among the ripened grasses.

Many of them grow in the Arctic lands and islands as well, and some are known to be circumpolar.

The growth and distribution of Alpine plants depends largely upon the amount of moisture at their disposal. Growth starts as soon as the water from the melting snow reaches their roots. Plants like the Penny-cress (*Thlaspi coloradense*) and the mountain forget-me-not (*Eritrichium argenteum*) often bloom while the snow actually covers them and are always

at their best at the edges of the melting drifts. Blooming in May at timberline, they are found successively higher as the season advances and the snowline ascends, until August finds them brightening the otherwise barren soil of the highest, coldest chasms. They make the season's growth after flowering and then curl up the rudimentary next year's stem and blossom in the heart of a compact little ball of leaves to withstand the long dry time. If August showers follow a July drought, many of them will bloom again, for the first touch of water, coupled with warm sunshine, causes the stem to elongate and the blossom to develop with almost incredible rapidity. For this reason, Summer comes suddenly to these high places. The meadows are frozen and dreary for months; then, some day early in June, water from melting snow dampens them, the next they are green with sprouting grass and within a week they are glowing and fairly pulsating with the "festival of breaking bud and scented breath."

> "A thousand odors rise,
> Breathed up from blossoms of a thousand dyes."

for nearly all of these plants are exceedingly odorful, most of them pleasantly so. The forget-me-not's breath resembles but excels the heliotrope's perfume; and so numerous are these tiny blue flowers that the wind bears their fragrance for miles across the valleys. Ginger-root, sweet androsace, alpine clover, Lloydia and dozens of others have more elusive but no less charming odors. However, the ill-smelling primrose does not belie its name and the foliage of the polemonium is anything but sweet-smelling.

All the plants that glorify the alpine meadows have had to develop some scheme to protect themselves from the full effects of the furious chilling and drying winds that blow more or less constantly around all high peaks. These continuous winds and the brilliant sunlight, so intense through the thin air, rapidly dry out the thawed surface of the porous soil on

the exposed portions of the meadow, so that plants, in order to live at all, must be able to conserve what little moisture they can absorb during favorable periods. Some have foliage that is finely cut into many very narrow, closely crowded divisions and, in some species, is curled up at the edges. Among these are mountain avens (*Sieversia turbinata*), purple polemonium (*Polemonium confertum*), yarrow (*Achillea lanulosa*), alpine wormwood (*Artemisia frigida*), and the cinquefoils (*Potentilla* sps). Others have only the tiniest of very narrow leaves, like the sandworts (*Arenania* sps), the harebell (*Campanula petiolata*), the narrow-leaved primrose (*Primula angustifolia*), the tonestus (*Tonestus pygmaeus*), the cushion pink (*Silene acaulis*), and the sweet androsace (*Androsace carinata*).

Many of these plants form broad intricate mats that hug the ground closely. No better description could be written of these plants than Wordsworth's:

> "There clinging to the ground it lies
> With multitude of purple eyes,
> Spangling a cushion green, like moss."

If we substitute "starry" for "purple," these lines describe accurately and equally well the cushion pink, the two-flowered sandwort, the paronychia, the alpine clover, the golden saxifrage, and the creeping sibbaldia. Among the very woolly types are the Arctic fleabane (*Erigeron simplex*), woolly four-nerve (*Actinella lanata*) alpine sunflower (*Rydbergia grandiflora*), dandelion ragwort (*Senecio taraxacoides*), mountain forget-me-not (*Eritrichium argenteum*) and cat's-foot (*Antennaria media*). Some have thick, fleshy leaves with a tough outer skin that prevents evaporation; examples of this type are snow-ball, saxifrage, golden saxifrage, roseroot, whitlow grass and stone-crop.

All parts of the meadow land are not uniformly moist though water from the clefts and chasms of the highest parts of the peaks is continually seeping downward through the rocks

into it. If it is caught and held in depressions or among underlying rocks, boggy areas are formed. In these places elkslips, speedwell, epilobium and red orpine flourish. If the seepage merely moistens the meadowland, we find onion, bistort, Lloydia and oreobroma among others. In some well

Mountain forget-me-not.

defined areas, the soil is deeper and finer than the meadow as a whole. Then avens, polemonium and mertensia crowd each other for possession and exhibit a ranker, greener growth than the surrounding territory is able to support. It is upon the driest, most gravelly soil that the most typical matted and woolly forms are to be found.

The plants that seek the protection of the boulders and the rocky ledges do not need so much protection from the

drying effect of the wind for the soil in the crevices and the pockets among the rocks is always damp. Its extent, however, is very limited; therefore, these rock dwellers have developed long, thickened tap roots that writhe and twist through the interstices to great depths. Upon the crowns of these roots they bear rosettes of broad leaves and many long-stemmed delicate flowers. To this type belong the ill-smelling primrose (*Primula Parryi*), the Pike's Peak forget-me-not (*Mertensia alpina*), the alpine synthyris (*Synthyris alpina*), the spring beauty (*Claytonia megarrhiza*), the rock ragwort (*Senecio carthamoides*) and the mountain sorrel (*Oxyria digyna*).

Among the few woody-stemmed plants of the Alpine Zone are the white dryas (*Dryas octopetala*), and the net-veined willow (*Salix reticulata*). A few shrubby willows and currants and the shrubby cinquefoil (*Dasiophora fruticosa*) are often found at short distances above the timberline, but these two form broad mats of stems and leaves that creep through and cling to the thinnest soil among the rocks at great elevations.

If you know the blue columbine of lower altitudes, you would be charmed by the diminutive spurs and the beautiful dark blue color of the tiny rock columbine (*Aquilegia saximontana*) which is to be found only on the loftiest rocky slopes. The alpine sunflower (*Rydbergia grandiflora*) is low, woolly, and stout, and bears showy, orange-colored heads that are two or three inches wide. They look enormous in that region of diminutive blossoms and they always face the sun, turning their faces from east to west in the course of the day. The alum root (*Heuchera Hallii*) always appeals to lovers of the lily-of-the-valley, so like it, in general appearance are its dense spikes of creamy, rose tinted bells. Roseroot (*Rhodiola integrifolia*) is like the door-yard "live-for-ever" as to foliage but it bears a dark purple blossom. Elkslips (*Caltha rotundi-*

folia) ape their cowslip cousins in their round, scalloped leaves, but the flowers are white within and purple tinged outside. Angelica (*Angelica Grayi*) is one of the largest of the alpine plants, growing from two to three feet tall. It belongs to the parsnip family and its broad leaves with their immense dilated foot-stalks, and its wide umbrellas of white flowers render it very conspicuous on the monotonous wastes of broken rocks. Harebells (*Campanula petiolata*) abounding in the lower zones, are to be found, late in the Alpine summer, nodding among the ripened grasses of the meadows above timberline. So thickly do they grow that they make great splashes of brilliant blue against the gold of the grass, and the crisp little corollas rattle together in the wind as if some passing tricksy fairy had set all their tiny bells a jingle. The arctic harebell (*Campanula uniflora*) grows on the highest, bleakest summits and extends into the Arctic regions. It grows only two or three inches high and bears a single, dark blue, funnel-shaped flower scarcely an inch long.

The mountain sorrel abounds in the arctic regions as well as upon our high mountains and it is said that the natives of Greenland use its roots for food. The *Chionophila* is found only on the highest peaks of the central Rocky Mountains, on the spots where the most enduring drifts have lain late into summer. From a little tuft of root leaves it sends up a dense, one-sided spike of tubular, cream-colored flowers, not unlike the indian pipe in general appearance. The alpine mertensia is called "Pike's Peak forget-me-not" because thousands of little nosegays of these dainty, fragrant flowers have been sold to passengers on the trains that ascend that famous mountain. The alpine paintbrush (*Castilleia occidentalis*) is but a pale reflection of the glorious species of the plains. Mostly pale cream or yellow, sometimes streaked with brown or purple, but never deeper than bronze, it is odd and interesting but hardly beautiful. The arctic gentians (*Gentiana frigida*) are

short stemmed and pale but as large as the morning-glories that they resemble. Of a yellowish color, but freely spotted with purple, they bloom late in the season and withstand quite a good deal of freezing so that they are one of the last flowers to be found in the autumn. Only one fern (*Cystopteris fragilis*) occurs up here but it does its little best to drape the damp rocks that harbor it.

There is no scarlet coloration among the Alpine flowers. Deep and glowing shades of rose, purple, magenta, and bronze abound, but there is no true red. Every other color is abundantly represented. None of the weeds of the lowlands grow in these high altitudes, but wherever the ground is trampled, along the trails and about cabins and stations, certain alpine plants like the cinquefoils and the whitlow-grass spring up, and, thriving as they never do in other situations, soon crowd everything else out.

Clover, onion, lily, lousewort, stitchwort, sunflower, blue-grass, timothy, daisy, ragwort, gentian, rushes, sedges; all have their Alpine counterparts. But it must not be supposed that they are the same plants, changed in response to their environment. They are as different in nature as the natives of the arctic lands are different from their prototypes of the Temperate Zones. Because of this difference, because they can endure sudden and extreme changes of temperature, long dry and cold seasons and fierce, continuous winds, and because they can get along on what nourishment their sluggish roots can coax from a reluctant soil, they thrive where any other plants could not live at all. The harebell and the sandwort are just the same above timberline as on the foot-hills. They grow just as high, the leaves are identical in form and size, and the blossoms are just as large. Because Nature has fitted them to live under a great variety of conditions they can grow through a great range of altitude, while most plants are restricted to certain levels on account of the climatic differences attendant upon changes of elevation.

VOLUNTEER PLANTS

By Mrs. G. T. Drennan.

REGARDLESS of riparian rights, stiffly disputed by property holders and municipal authorities, volunteer plants, from self-sown seeds, have taken possession of the Gulf coast, "some in rags, some in tags, and some in velvet gowns." They have virtually established an Experiment Station. One lesson they teach is that many flowers considered delicate and requiring special care are hardy. Some of them do as well, others much better, than when grown from fresh, selected seeds and given the most approved modes of culture under the best environment.

The Shasta Daisy is a shining example. This is simply Burbank's greatly improved form of the iron-clad type, *Chrysanthemum leucanthemum*, the common ox-eye daisy, one of the farmer's pests. It self-sows its seeds which the Gulf breezes blow hither and yon. Seedling plants follow.

The Transvaal or African daisy, introduced here since the Boer war, has established itself in blazing orange-yellow with the profusion it exhibits on its native veldt. It has spread beyond the confines of culture everywhere, from the gardens of its first occupancy. For brilliant display it exceeds any flower of equal delicacy I have ever known and is fine for parks.

The *Gaillardia* or blanket flower, conspicuous for its broad rays of brownish-crimson and bright yellow, and its velvety-purple cushion-like disk, has spread from self-sown seed, naturalized itself and makes the coast gay with its blossoms from spring till winter.

The *Coreopsis* or *Calliopsis* in bright yellow, copper, bronze, and brown, blooms incessantly, a free lance among grasses, reeds, ferns, and weeds. Its charming peculiarity is that its stems are tall, strong and wiry. The foliage is close to the ground, so the flowers seem to be floating upon the air. Its type is the despised "tickweed" of the woods, a weed with nothing in its favor except that it is the progenitor of the six varieties of coreopsis, beautiful garden flowers. No matter where your garden stands, north or south, from one paper of seed, sown fall or spring, these plants bloom the first season, self-sow and spread in volunteer ranks, year after year, perpetually. No need to sow fresh seed every year; they do that themselves.

Under self propagation, however, some of our most beautiful flowers rapidly degenerate. They demand intensive culture. Pansies are prolific seed bearers and volunteer plants are numerous, but left to nature, without cultivation, they invariably revert to the type *Viola tricolor,* with both plant and flower diminutive. *Portulaca,* of most gorgeous oriental colors, will degenerate to the semblance of its type, the common purslane, with flowers no larger than a little pearl button and stems, bare of leaves, that look like earth worms; the flowers pale pink and yellow exactly like those of the "pigweed" purslane. *Phlox Drummondi,* a native of the Texas prairies, answers the call of the wild in prodigious numbers of volunteer plants. From highly improved strains of all the colors of pink, rose, crimson, lavender, and pure white, the self-sown seedlings produce perfect flowers the first year. After that, every year shows degeneracy. The blooms get small, the foliage shabby, and the colors are confined to the pink and red of the type.

The Mexican poppy self-sows its seeds, volunteers in hosts, and, unlike all other poppies, blooms from June to

the close of November. Silvery white, with golden anthers and sinuate-lobed glaucus foliage, the flowers are enchanting. This Mexican species grows in pure sand on the beach where the sun is unobstructed. Also it volunteers, higher up, on land more fertile and solid; always in the sun; never in the shade.

HOW BRAZIL NUTS GROW

By H. E. Zimmerman.

BRAZIL nuts are commonly known as "cream nuts" and "nigger toes." They are the seeds of a majestic and beautiful tree which grows to the height of 100 to 120 feet in the Mandrucu country of Brazil. The nuts are compactly arranged within the pericarp (shown in the illustration) like the sections of an orange. When these pericarps, nearly as large as a man's head, are stripped of their fibre, they look like cocoanuts. They do not burst and let out their nuts, but, when ripe, fall to the ground, where they have to be broken open by force in order to get the nuts within. They are so thick and hard, that it requires a sledge-hammer blow to break them open. It is a very dangerous thing to walk under such a tree, for, if one of the pericarps were to strike one on the head it would probably mean instant death; or if it fell on another part of the body it might break a bone or injure the person seriously. Even the monkeys will not risk going beneath these trees during the season when the nuts fall to the ground.

In order to gather these nuts all at one time, the Mandrucu Indians are compelled to take certain risks. If he climbs the tree to dislodge the nuts he is likely to overlook one, which may be the very one to fall and strike him while subsequently

gathering the nuts from beneath the tree. To minimize the danger the native wears a wooden helmet, something like that of a fireman, and takes care to walk upright as much as possible, for, if one of the falling pericarps should strike his

spine, there would be a crippled Indian for the rest of his life—if not a dead one. These nuts are used on a considerable scale as an article of food by the Indians. They are also exported to nearly all civilized countries. They yield a large quantity of oil which is good for burning.

USES OF CACTI

By Paul G. Russell.

DURING the years 1910, 1913 and 1915 the writer accompanied botanical exploring expeditions to Mexico, the West Indies and South America. These expeditions were sent out for the express purpose of studying the cactus flora of the regions mentioned. The information for this paper was obtained partly from personal observations made in these countries and partly from the published experiences of others. The fact that the cacti will grow under such adverse conditions of temperature and soil makes any information concerning their uses of much greater importance when we consider the vast amount of arid land in our great Southwest. Furthermore, throughout Mexico, Central and South America there may be seen great stretches of deserts upon which very little except cacti will grow. The uses of the cacti may be conveniently grouped according to the nature of the use, and this plan has been followed in the present paper.

Alcohol. The fruit of the prickly pear known as *Opuntia ficus-indica* Mill. contains about 14% of sugar. By a fermenting process, some French industrial chemists in Algeria have succeeded in obtaining 45 to 60% of pure alcohol from 220 pounds of this fruit. While this alcohol, produced by fermentation, is of excellent quality and agreeable in taste, it has been found true, in Mexico at least, that if the juice is distilled it produces a "tuna alcohol" which is very injurious as a beverage. However, it is also true in that country that the fermented juice is made into a drink.

Beverages. While the juice of most of the large cacti is bitter and nauseating, there are two at least, *Echinocactus*

emoryi Engelm. and *E. wislizeni* Engelm., from which palatable water can be obtained by the thirsty traveler in desert country in an emergency. In his bulletin on "Desert Plants as a Source of Drinking Water", Mr. F. V. Coville tells how their Indian guide cut off the top of an *Echinocactus,* pounded and squeezed out the watery pulp in the inside of the plant, and then drank the slightly salty water with apparent relish. On the slopes of the volcano of Colima, Mexico, is found an epiphytic cactus, *Epiphyllum anguliger* G. Don, from the fruits of which a refreshing drink like lemonade is prepared. In other parts of that country a drink called by the natives "colonche" is prepared by fermenting the juice obtained by pressing the fruits of the large prickly pears.

Building Material, Furniture, Etc. The hard, reticulated skeletons of several species of *Opuntia* are used for various purposes, such as the manufacture of napkin rings, walking sticks, table and chair legs, and even for veneering. In Mexico the very poor inhabitants make their huts from the trunks of the taller columnar cacti, but in South America the writer saw genuine lumber cut from the immense trunks of the "mandacaru" (*Cereus jamacaru* DC.). In the state of Bahia, Brazil, houses and sheds are made of this wood alone, and in appearance at least, they compare very favorably with some of our American dwellings. The wood is somewhat harder than white pine.

Calking. The cordwood cactus, (*Cereus gummosus* Weber), according to C. R. Orcutt, yields a gummy substance which has been used to calk boats.

Dyes and Coloring Material. The Nopal, (*Nopalea coccinellifera* Salm-Dyck), is the chief host plant of the cochineal insect, from which cochineal dyes are obtained. Until the introduction of aniline dyes, the cochineal industry was very important. At the present time cochineal cultivation has been discontinued nearly everywhere except in the Canary

Islands, although if the trade restrictions imposed by the European war continues indefinitely, the lack of aniline dyes in many countries will necessitate the utilization of the cochineal insect once more. These insects are also found on other cacti, of the genus *Opuntia*, but not in abundance. In parts of New Mexico the juice of *Opuntia* fruits is used in coloring ice cream, confectionery, beverages, etc., producing a beautiful magenta.

Fertilizer. Bois claims that the penetrating roots of *Opuntia ficus-indica* Mill. broke up the lava-covered ground around Mt. Vesuvius and Mt. Etna, and the subsequent decaying of the joints rendered the soil very fertile. In Ceylon, India, and in South Africa the prickly pear is employed as a fertilizer, according to Johnston and Tryon.

Fiber. According to Watt, a kind of coarse fiber has been obtained in India from *Opuntia dillenii* Haworth, and were it not for the plentifulness of other material, this fiber could be used for paper pulp. In an article of Diguet's, he says that the sides and tops of *Pilocereus alensis* Weber are covered with vegetable wool, which was formerly much used in Jalisco, Mexico, for stuffing cushions, pillows, etc. It did not break or settle as easily as other fibers, for example that of bamboo, and when mixed with a quarter of ordinary wool, was made into very good felt for hats. Furthermore, this vegetable wool was not attacked by insects as is animal wool.

Fishhooks. Dr. Edward Palmer, the well-known collector of Mexican plants, tells in his notes how cactus spines have been made into fishhooks by the Mohave Indians of the Colorado River, and cactus spine fishhooks have been found in prehistoric graves at Arica, on the coast of Chile.

Food. Both the vegetative portion and the fruit of the cacti are used as human food wherever these plants make up a large part of the flora. The Indians of the western part of the United States are said to roast joints of various *Opuntias* in the cinders, the spines burning off and the flesh becoming

soft and sweet. In Mexico the young tender mucilaginous pads of many *Opuntias* are cut into strips, "nopalillos", and cooked like string beans, and from the larger species of *Echinocactus* the Mexican "dulces" are made. The flesh is cut into strips and boiled in water to which is added large quantities of cane sugar. After boiling thus for some time, these strips are dried, and sell very readily in the markets. A large number of cacti furnish choice fruits, all known as "tunas". The writer has seen many of these for sale in the markets of the large towns on the west coast of Mexico, of which one or two kinds would be worth introducing into this country. In San Luis Potosi, Mexico, one of the most important foods sold in the markets is the "tuna cheese", made usually from the fruit of *Opuntia streptacantha* Lem. W. L. Bonney says that the cheese is made by simply boiling and straining the tuna pulp until the proper consistency is reached. It is of a chocolate color, pleasant to the taste, wholesome, and slightly laxative. Sometimes nuts or flavors are added, and the product is more appetizing when taken with milk. The "pitahayas" are the fruits of various species of *Cereus*, and the sweet "tomales" are prepared by taking out the insides of these fruits and allowing these insides to dry for several days. A certain kind of tuna fruit is sold in the fruit stores of most of our cities, largely as a curiosity, for it is usually very tasteless. "Cactus candy", which is the Mexican "visnaga dulce", is put up in jars and sold in many places. According to Mr. W. E. Safford, the fruits of *Echinocactus longihamatus* Gal., which are called "limas de visnaga", are used in cooking as a substitute for lemons. He also says that the fruits, "chilitos", of *Mamillaria greggii* (Engelm.) Safford are relished for their acidulous, cranberry-like flavor. He further states that the seeds of nearly all the species of *Pachycereus*, "cardones", are used by the Indians for food. The "higos de tetetzo" of southern Puebla, seeds of *Pachycereus columna-*

trajani Britton & Rose, are a regular food staple and are found in the markets of Tehuacan in the month of May. Griffiths tells us that very palatable jellies are manufactured in Mexico from the prickly pear fruits, and the young joints are made into pickles.

Forage. Probably the most important use of the cactus is, or at least will soon be, its use as a forage plant in desert regions. The cacti used for forage are practically confined to the genus *Opuntia*, of which the flat-jointed kind, or prickly pears, and the round-jointed, or chollas, are both useful, the former for its joints, the latter for its fruits. "Cholla" is a term applied to the fruit and also the entire plant of the round-jointed *Opuntia*. The fruit is eagerly eaten by sheep, with no bad effects, but it lacks sufficient nitrogen to sustain life for an extended period when it forms the sole article of diet. The chief drawback to the use of prickly pear joints as forage is, of course, the spines, although cattle do not hesitate in an emergency to devour anything which contains water. Experiments with the singeing of cacti to remove the spines have been quite successful in Arizona, according to J. J. Thornber, although the cost of the operation is an important factor. The so-called "spineless cactus" of Luther Burbank has been found to revert back to the spiny condition of its ancestors, but there are two or three nearly spineless *Opuntias* which are native in New Mexico and Mexico which promise much for the future.

However, the cactus can only be utilized as an emergency ration. It is in tiding over periods of drought that it has proven so valuable in the past. The cattle are able to subsist with no water at all when cacti compose the greater part of their diet.

Fuel. The amount of available fuel in an arid country is necessarily so small that anything which will burn is used, and the dried stems and trunks of most of the cacti are very welcome to the inhabitants of the American deserts. The large columnar species of course furnish excellent fuel.

Hairbrushes and Combs. Among the Indians and poorer Mexicans of northwestern Mexico the custom has been observed of using the fruit of *Pachycereus pectenaboriginum* Britton & Rose as material from which to make hairbrushes. The long yellow spines are trimmed off from one side, leaving a place for the hand, and the result is a rude but remarkably serviceable hairbrush. In Chile, according to Safford, combs have been made of the long stiff spines of a species of *Cereus.*

Hedges. Almost anywhere in cactus country one may see hedges made from growing plants of the columnar Cerei and the tall *Opuntias.* These living fences, with the stout trunks and interlaced spines, form an effective barrier against man or beast, and, owing to the high water content of the cactus, serve even in some localities as a protection against fire.

Materia Medica. The roots of *Cereus striatus,* Brandegee, are cut into thin strips, dried and sold in the markets in Mexico for medicinal purposes, according to Dr. Edward Palmer. They are called "raiz de nopal", and are supposed to assist in the knitting of broken bones. The milk of certain species of *Mamillaria* is employed in Durango, Mexico, according to Safford, for healing cracks in the feet of the natives, and in other places is administered internally for various purposes. The leaves of *Opuntia dillenii* Haworth are often used in India as a poultice, and the juice is a very efficient purgative.

Aporocactus flagelliformis Lem., the rat-tail cactus, produces beautiful rose-colored flowers which are used medicinally in Mexico, being sold under the name "flor del cuerno", and the flowers and stems of *Selenicereus grandiflorus* Britton & Rose have been used in the form of a fluid extract as a cardiac stimulant. The action is similar to that of digitalis, but less uniform. Certain astringent principles are said to be found in the roots and bark of *Opuntia karwinskiana* Salm-Dyck. The "mescal buttons" which are sold throughout this country are merely the dried tops of *Lophophora williamsii* Coulter,

a cactus found all through Mexico, and also in the southwestern part of the United States. These buttons are of a brownish color, nearly circular, about one-half of an inch in diameter and one-fourth in thickness. According to Prentiss, the Kiowa Indians, who are found in the vicinity of the Arkansas River and southward, used these in their religious ceremonies. The custom was for each Indian participating to chew and swallow four or five of these buttons, with the result that he soon had the most wonderful visions, usually in the nature of extraordinary color phenomena. However, such were the effects of this drug upon the Indians that their white neighbors made complaint, and the government has made its use illegal, except for strictly medical purposes. In medical practice the alkaloid to which it owes its power has been very useful, especially in treating nervous disorders, chronic pains, etc., acting as a cerebral stimulant. It is sold in the form of a tincture, as a powder, or as buttons.

Needles. When assisting at the opening of some ancient graves at Iquique, Chile, Mr. Safford relates that he found cactus spines which had been used for needles, and also for mending slits in sealskins. The spines of some of the Chilean cacti are several inches in length, and might well serve for many purposes.

Ornamentals. The value of cacti as ornamentals is so well known all over the world that little need be said concerning their oddity or striking beauty. A word might be said, however, in favor of a more extensive introduction of these remarkable plants into the southern states of our own country, for in a warm climate they require almost no care. Some of the prickly pears will grow out of doors as far north as Nantucket, Massachusetts. In a bulletin of the Department of Agriculture Mr. C. H. Thompson has treated the ornamental uses of the cacti in a very thorough manner.

Resin. It has been discovered in Mexico, according to C. E. Guyant, that an analysis of the dead bark of *Cereus thurberi* Engelm. indicates that the resin content is sufficient in quantity and easily enough extracted to make its utilization practicable in cactus regions of this country.

Whitewash. We are informed by F. W. Goding that in Uruguay the leaves of a common cactus, (probably an *Opuntia*), are sliced and macerated in water for twenty-four hours, producing a creamy solution, to which is added lime, and the whole well mixed. When this is applied to any surface, be it of wood, brick, iron or other material, a beautiful white appearance is produced which withstands the action of the elements admirably. This practice is also quite common in northern India, according to Johnston and Tryon. The particular cactus here used is *Opuntia ficus-indica* Mill. In both cases, the part played by the cactus is the supplying of a mucilaginous substance which causes the whitewash to adhere.

Miscellaneous. The pulp of *Nopalea* sp. is said to clear water of impurities or settle coffee in the same manner as the white of an egg, according to Bois. The writer has used cactus spines many times for toothpicks, also for dissecting needles, for both of which they were very satisfactory.

FRAGRANT WILDFLOWERS

THE list of fragrant wildflowers published in the May number of this magazine has brought out additional points regarding the odors of flowers which we purpose publishing from time to time. The following will, therefore, be of interest:

Mr. Fred E. Burlew writes: "To the list of fragrant wild flowers from Southern California may be added one of the sand verbenas (*Abronia umbellata*) and our Western Goldenrod (*Solidago Occidentalis*). *Datura meteloides* should be included and also *Brickellia Californica,* usually overlooked because it is not at all showy. The plant listed as *Solanum xanti* is fragrant at San Diego and as far north as Laguna Beach, but in the vicinity of Los Angeles and in the neighboring mountains it is not fragrant. Of our ill-scented flowers perhaps *Isomeris arborea* deserves first place."

From Mr. C. L. Gruber we have received the following note: "During spring and summer I have devoted some time to investigating the fragrance of wild flowers and, while I have tested the fragrance of almost two hundred species by this time, I naturally missed quite a number for want of time to follow them up properly. One of the chief problems I have encountered is just where to draw the line between fragrant and non-fragrant flowers, since there are all degrees of fragrance from the faintest delightful odor to a full volume of sweetness. One of my surprises was given to me by the perfoliate bellowort (*Uvularia perfoliata*) which I found to be deliciously sweet lemon scented. Concerning the *waiting list* mentioned in the May number of the *American Botanist,* I

can furnish the following information taken from actual tests in the field: *Cornus florida* has a pleasing, sweet, well defined fragrance. *Eupatorium purpureum* is moderately fragrant. *Amelanchier Canadensis* has a pleasing odor. In some specimens I found it quite noticeable, in others rather faint. *Rhus glabra*, especially when growing in open sunlight, is quite fragrant. *Asclepias tuberosa* and *Diervilla trifida* are not fragrant. I find it a general condition that fragrant flowers of the same species are more fragrant when growing in sunlight than when growing in shade."

Miss Caroline G. Soule adds *Galium asprellum* to the list of fragrant species and says: "I put a spray of *Galium asprellum* out of my room last evening, it grew so sweetly fragrant after sunset, no odor being noticeable earlier though it had been in the same place all day." Without knowing the species in question the editor questions whether it was the flowers or the foliage that was sweet-scented. *Galium triflorum*, a closely related species, is sometimes called sweet scented bedstraw because the foliage is fragrant in drying. We hope later to publish a list of plants with sweet scented parts other than flowers. Many such plants have a disagreeable odor when fresh, the sweet clover for instance, but develop much fragrance as they dry.

NOTE *and* COMMENT

Seeing Nature.—I have known teachers who seemed to think that the value of a nature excursion is measureable by a pedometer. "We took a three mile walk this morning, and feel exhilarated." It is that spirit of athleticism crowding out mentality and heart perception that is one of the greatest dangers, especially of Boy Scouts on their marches. They cover miles, but no territory. They strengthen, not the mind and heart, but the legs. They have good eyes, but see nothing. Let us hear from Ruskin a word so frequently quoted as to be almost trite, "The biggest thing in the world is to see something and then tell it." What an exaggeration that seems. Anybody with a pair of eyes can see something, yet the seers are few and the tellers even fewer. The art of keen observation is a rare gift. Because most people are lacking in that faculty, or because they have had it destroyed by searching for freaks, is one reason why nature study is not enjoyed by more people. It is a wise naturalist that knows his own parish. Do not try to go far. There are foreign, undiscovered lands in every bit of grass or moss within a few feet of where you are now standing. Nature is simple in her simplicity. But do not forget that she is majestic in her majesty, and that she is infinite in her awe and mystery. Wherever you stand has been an infinite past and will be an infinite future. Do not forget that you are at the center of thirty-two points of the compass. You may look every way if you will.—*Edw. F. Bigelow in Normal Instructor.*

Spanish Peas.—What are Spanish peas? Among other things that the Government has forbidden to be exported to Mexico are Spanish peas, but no indication is given of their botanical affinities. Doubtless those down on the border know all about them, but Bailey's "Cyclopedia of Horticulture" is not acquainted with them—at least under the name given—and we have not been able to find anybody else who is. Can any of our readers supply the information? Specimens in our possession do not closely resemble other peas. They are used for human food in some parts of our country but no seed catalogue, to which we have access, offers seeds.

Soil and Plant Habitat.—The botanist and the flower-gatherer soon come to recognize instinctively various plant habitats, partly from the mere looks of the place and partly from the conspicuous plants which grow there. So well known is this connection between the soil and the plants which inhabit it that we naturally expect to find certain species where we find other very different ones growing. Fern hunters in search of the adder's-tongue or the curly grass (*Schizaea*) often rely upon "call plants" growing with them to indicate their whereabouts. We do not expect hickory-nuts on every wooded hillside, nor strawberries in every field. It all depends upon the soil. This is also the reason we seldom find huckleberries, arbutus, laurel and the pink lady's slipper growing with trillium, bloodroot, phloxes, mandrake, and the like. Even the trees in whose shade these two groups of plants grow are different. With the first group we find pines and oaks and with the second basswood, ash, and maple. We find, however, that the soil not only influences the character of the plants which grow in it, but the plants in turn influence the soil. The leaves of certain plants produce acids when they decay while others become alkaline. If the soil is calcareous, the acids may be neutralized and form habitats in which our ordinary plants can grow, but if the soil is acid only certain specialized plants

can survive in it, such as the heaths, some of the orchids, the pitcher plant, sundew, and various others. Until recently, the acid soils were supposed to be confined to the bogs, but it is now known that many upland soils may be acid and form peaty deposits similar to those in the bogs. This accounts for certain species of heaths living on hillsides. At present, the principal plants of the acid and alkaline soils are fairly well known, but the lesser species are not. It would be an interesting experiment to list the plants of two such regions and accurately determine which species are confined to each. Undoubtedly there are some that will grow in either, but the number is likely to be small in comparison with the list of those confined to one soil or the other.

French Turnips wanted.—A subscriber asks for information regarding a plant called French turnip which he says he used to grow when a boy in Connecticut. It had leaves like a rutabaga, white flesh and the largest roots would fill a peck measure. It was always transplanted after early peas, potatoes and onions. In a good cellar it would keep until the following May and was highly prized. It was often sliced and fried and formed an appetizing dish. This form is not mentioned in Bailey but possibly some of our older subscribers may recall it.

Tree Rusts on Ferns.—Genetically, ferns and conifers are not very widely separated and it is only fitting that several of the rusts that occur on fir trees should have their alternating stages on ferns. Three forms of a rather abundant rust of this kind have been named *Uredinopsis struthionidis, U. Osmundae,* and *U. Phegopteridis* in reference to their fern hosts. Another species, *U. pteridis,* which has long been known to attack the bracken (*Pteris aquilina*) causing blackish lines like sporangia on the fronds, has recently been found growing on *Abies grandis* in the Northwest. There are some thousands of species of rusts, most of which live on two different plants

during their life cycle. Often these plants are entirely unrelated as is the case with the apple rust whose initial stages occur on the red cedar, or the corn rust which lives on species of oxalis during part of its life.

The Obedient Plant.—*Physostegia Virginica* is usually called false dragon head or lion's heart in the books, but the knowing ones call it obedient plant because of the curious habit the flowers have of keeping any position in which they may be placed. Turned either to the right or left, they do not spring back when released as other flowers do. The structure of the pedicel which makes such changes possible appears never to have been studied nor, so far as we know, has any attempt been made to discover what use this peculiar faculty is to the plant. Happening recently to pass numerous clumps of this plant on a windy day, we observed that all the flowers were turned away from the wind and remained in this position during lulls in the breeze. We are disposed to suggest, therefore, until a better explanation is forthcoming, that the yielding of the flower stalks to pressure of any kind serves to protect the essential organs by turning the opening of the flower away from danger.

A Decorative Flax.—A most attractive and decorative plant for the border is the perennial flax (*Linum perenne*). If planted in any good garden soil in a situation where it is shaded for the early part of the day, it will reward its possessor with a cloud of sky-blue flowers each an inch or more across, from May until well into September. The flowers are rather evanescent and usually fall from the plant by the middle of the day, but new ones are produced daily and give the plant an air of freshness throughout the summer. On single sprays of this plant, we have counted the remains of no less than 65 blossoms showing a blooming season for single twigs of more than two months. Blue flowers are never very abundant in the flower garden. Many of those called blue have enough

red in them to take on a purplish hue, but the flax is clear blue, only, and therefore most desirable.

Flower Color Identified.—According to a recent report, flowers are colored blue by meta-oxy-diethyl-diamido-phenyl-ditolyl-carbinol-disulphonic acid. It is very evident that the science of chemistry is badly in need of a Linnaeus.

White Cypripedium Acaule. — Mr. MacNamara's white *Cypripedium acaule* is a very common flower in this region. I have seen more than thirty this last June, had twelve in my room for several days, and Mr. Walter Deane tells me that on a mountain, close by, white and pink flowers grow near the base, then more white and fewer pink as one ascends the slope and near the top they are all white; not a pink flower to be found. When prepared for herbarium use the white blossoms turn pink and when they begin to fade or ripen in water, the white blossoms show either veins of pink or a slight flush of pink.—*Miss Caroline G. Soule, Shelburne, N. H.*

A Double Rudbeckia.—This time the expected has happened. Mr. George Redles has found a completely double flower-head of *Rudbeckia hirta,* at Somerton, Philadelphia. From an examination of the flower, which he kindly forwarded, we find it to be a true doubling, as the word is used with reference to composites, and not a freak due to the attacks of gall-flies or fungi. A half double form is illustrated on page 533 of Gagers "Fundamentals of Botany," but Mr. Redles appears to be the first to report a completely double form. The plant has been transferred to the garden where it is hoped it will increase in luxuriance. It may be said in passing that although the flower-head resembles a prize chrysanthemum in miniature it is not really double in the sense that a rose is double. There are no extra parts present. The disk flowers have simply taken on the form of the rays. The form might be called *Rudbeckia hirta multiligula* instead of the usual *flora plena* which the gardener applies to all sorts of double flowers.

Soap Plants.—Now that the war has caused an increase in even the price of soap grease, a lively interest is being manifested in all sorts of saponaceous plants. One or two of these soap-yielding species have been articles of commerce for a long time, notably the soap bark derived from the South American trees, *Pithecolobium bigeminum* and *Quillaia saponaria.* A stock of this bark is carried by most drug stores. The soapberry (*Sapindus saponaria*) is also used for washing clothes in the tropics but a little soap goes a long way in such places. The common bouncing Bet (*Saponaria officinalis*) gets its generic name from the soapy qualities of its juice, while its specific name would indicate that at some time it, too, was sold in shops. The substances in plants that give them their saponaceous qualities are called saponins. They are really glucosides, that is, substances which upon breaking up yield sugar and some other substance. With water all saponins form a froth or lather. Some are occasionally added to certain frothy liquids to help out the froth, incidentally making a barrel of the liquid last longer. Saponins have been found in more than a hundred species of plants. Among the plant families represented by saponaceous members are the Liliaceae, Dioscoreaceae. Araceae, Chenopodiaceae, Phytolacaceae, Caryophyllaceae, Berberidaceae, Magnoliaceae, Ranunculaceae, Bixaceae, Theaceae, Rutaceae, Zygophyllaceae, Meliaceae, Polygolaceae, Pittosporaceae, Rhamnaceae, Saxifragaceae, Passifloraceae, Bignoniaceae, Leguminosae, Primulaceae, Sapotaceae, Oleaceae, Solanaceae, Schrophulariaceae, Rubiaceae, and Compositae.

EDITORIAL

The controversy regarding the proper names to be applied to our plants began some years before this magazine was published, and although we were then assured that a stable nomenclature would result in a short time, the passing years seem to have brought that desirable end no nearer. As a matter of fact, we are rather worse off now than at the beginning, for we now have two brands of nomenclature; one, the "American Code", popular in two small areas along the Atlantic coast, and the other, the Vienna Code, followed by the rest of the world. With two conflicting codes in the field, there is naturally much confusion as to the proper names plants should bear, and this confusion is made greater by the changes in well known names which a faithful following of either code makes necessary. Juggling plant names is a much less fatiguing pastime for the easy chair botanist than hunting up new facts about the plants themselves, but name tinkering does not appeal to florists, nurserymen, horticulturists, druggists, gardeners, and landscape artists who have real money invested in their respective businesses and find themselves hampered by so many different names for the same plant. As a last resort they have issued an Official Code of their own which they propose to follow in labelling, cataloguing, ordering, and otherwise mentioning, cultivated plants. This third code differs from the rest in being founded on common sense instead of on a certain set of rules for playing the game. The Joint Committee having the matter in charge have

selected the nomenclature of Bailey's "Cyclopedia of Horticulture" as a sort of standard and have issued a list of the names it is proposed to use together with others by which the plants are known. When the 7th edition of Gray's Manual appeared, the editor of this magazine suggested that the names in the Manual be taken as the standard names of our eastern American plants, but the promoters of that work did not appreciate the advantage this would have been to American botany, and as soon as the book was published began enthusiastically to curtail its usefulness by making a lot of additional changes in the names. When we began studying botany we assumed that the names of plants were applied to them to render mention of them intelligible to others, and it took us a long while to discover that the chief purpose of giving a name to a plant was to see if anybody could dig up an earlier name to supplant it. The labors of these seekers after "priority" always remind us of a bunch of small boys playing "duck on a rock", in which game the object is always to knock the other fellow's duck off the rock. The names in the new code are often arbitrarily selected, but if those most interested will unite in using them we shall soon have one stable brand of nomenclature in America at least. This magazine proposes to follow the list in mentioning cultivated plants hereafter and the editor believes others will find it desirable to do likewise.

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The list of edible wild plants promised for this number has proven to be a somewhat larger undertaking than it at first appeared and its publication is therefore deferred until a later number. Meanwhile, further notes regarding plants to be included in the list are invited. It will probably be necessary to publish a preliminary list in order to call out notes from many observers.

Our readers are probably aware that Congress has set its approval upon a zone system of postage rates for magazines, similar to the zone system now existing in connection with the parcels post. This system will undoubtedly increase the cost of all magazines to subscribers at any great distance from the office of publication, for publishers will certainly add the cost of transportaton to the subscription price. The new rates do not go into effect until July 1, 1918, but in anticipation of an increase we would say that to all subscribers definitely on our "permanent" list before that date, the price will not be advanced. The "permanent" list, it may be said for the benefit of new subscribers, consists of those who order the magazine continued until ordered stopped. If paid for within the year, the price to such subscribers is $1.00. At the suggestion of a subscriber, we have decided to reopen the old "permanent" list at 75 cents a year to all who have complete sets of the magazine or who subsequently become possessed of a set. Since the number of full sets remaining is less than fifty, the chance to get on this list of immortals is rapidly diminishing.

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For thirteen successive seasons, the Tasmanian Field Naturalists' Club has made an Easter camping out expedition to various picturesque spots in Tasmania and the adjacent islands. Through the kindness of some unknown friend, we have received the reports of the trips from which it appears that this type of nature study is both interesting and popular. If the editor ever gets as far away from home as Tasmania, he proposes hunting up the Field Naturalists' Club and begging an invitation for Easter week.

BOOKS AND WRITERS

Five chapters, covering some 200 pages, are comprised in the second and concluding volume of Dr. William F. Ganong's "Textbook of Botany for Colleges," issued by the Macmillan Company. Four of these chapters are devoted to the phylogeny of Thallophytes, Bryophytes, Pteridophytes, and Spermatophytes, respectively, and the fifth discusses the classification of plants from an ecological viewpoint. In the pages devoted to phylogeny, the divisions, classes, and orders of plants are introduced in the customary sequence and their essential features carefully described together with much information regarding the ecology and distribution of typical forms which must be exceedingly valuable to those desiring a comprehensive view of plant relationships. In the ecological classification of plants, the author has departed somewhat from the usual textbook treatment and, instead of emphasizing the plant association, has paid more attention to growth and habit forms. The vegetation of the world is placed in seven divisions: hydrophytes, mesophytes, tropophytes, helophytes, xerophytes, halophytes, and oxalophytes. The tropophytes are those plants usually classed as mesophytes which are exposed to xerophytic conditions for part of the year. The helophytes might be described as spermatophytes and others which have taken to an aquatic or semi-aquatic life and are not true hydrophytes, such as the algae. In view of the similarity in sound between helophyte and halophyte, the reviewer suggests the term paludophyte for the former. It has essentially the same meaning. The oxalophytes, as may be surmised, are the plants of bogs and other undrained areas where the soil or soil-water is acid. The first volume of Dr. Ganong's book, issued last year, is an extended and particularized account of the structure, morphology, and

physiology of the different organs of the plant, and with the present volume forms a very interesting presentation of the whole subject. The volume just issued costs $1.00. It is marked Part II. and is paged consecutively with the first part, indicating that the two are ultimately to be bound in one.

If anybody who reads "The Joyous Art of Gardening", by Frances Duncan, fails to see the joyous part of it, the fault is surely not the author's, for she writes in a way that should prove an inspiration to anyone with the slightest interest in growing things. The author is a well known writer on gardening subjects and in this book has treated of back yard fences and their improvement, pergolas, lattices, cold frames, cuttings, pruning, transplanting and similar matters that are of perennial interest to the gardener. Although it does not claim to be a manual of gardening, there are lists of trees, shrubs, and herbaceous plants for various effects, directions for selecting and planting the right kind of specimens, and sufficient other observations to cover 230 pages. The book is intended for the beginning gardener and ought to make interesting reading even in city flats. It is published by Charles Scribner's Sons at $1.75.

"Useful Plants Every Child Should Know", by Julia Ellen Rogers, appears to be a pretty complete account of the food and fiber plants of the world. The book, however, is not a dissertation on how to grow the plants, nor yet a description of their botanical characters, but is instead an entertaining treatise on their origin, relationships, flavors, methods of preparing for the table, and other general good qualities which the botanist usually omits as foreign to pure science, but which is the chief theme of the housewife, Few books of its size contain more useful information or have it presented in a more attractive way. It is published by Grosset and Dunlap, New York.

Just as this number goes to press, we are in receipt of advance copies of "Experimental General Science" by Willard N. Clute. Although several texts in general science have appeared during recent years, they have not convinced the author that the demand for books of this character has been fully met, and he therefore offers his own views on the subject. Teachers generally have come to no agreement as to exactly what should constitute a course in general science. A large number would skim the cream from the special sciences, teaching a sort of elementary science composed of the interesting parts of botany, zoology, geology, chemistry, and the like, and leaving the husks for the regular teachers of such subjects. The present book takes the view that general science should concern itself with the general principles underlying all science and find illustrations of these principles in the child's immediate environment without regard to their bearing on the other sciences. Accordingly the book discusses the structure and composition of matter and the effect of different forms of energy upon it, thus involving combustion, change of state, radiation, evaporation, pressure, light, color, sound, and many allied matters. A sufficient amount of physiology is also included to meet the demands of certain State laws on this subject. Practically all books on general science are designed principally for recitation purposes, but the author believes that the child should learn by doing, not by reciting about it, and the course he suggests, as the name of the book indicates, is largely an experimental one in which the student is directed how to investigate nature's laws for himself. At the end of each section of the book, there are a large number of questions and directions for experiments, the text itself being considered to be largely explanatory. In consequence, the student is usually able to carry on much of the work without the aid of the teacher. In the author's

classes in a large city high school, the students usually work individually instead of in classes. The book contains 300 pages and nearly a hundred illustrations and is published by P. Blakiston's Son & Co., Philadelphia.

A new volume recently added to the Macmillan series of Rural Manuals, under the editorship of L. H. Bailey, is the "Manual of Fruit Diseases" by Lex R. Hesler and Herbert H. Whetzel. Beginning with two chapters on the apple, fourteen of our other principal fruit crops each have a chapter devoted to the diseases that injure them. In every case the cause of the disease is given, the symptoms described and the methods of control, when any are known, described in detail. A very comprehensive list of references to the literature of the subject follows the account of each disease. A chapter on the preparation and use of fungicides closes the volume. The usefulness of the book to the general reader is shown by the fact that it is singularly free from the technical terms used by most writers on plant diseases and that there is a glossary which defines the few terms found necessary. The treatment of the subject is most comprehensive. More than 450 pages are required to cover the subject. There are also 125 good illustrations. The price is $2.

Doctor William Trelease, formerly Director of the Missouri Botanical Garden and now professor of botany in the University of Illinois, has issued a little book on "The Plant Material of Decorative Gardening" into which he has crowded a large amount of information about woody plants for the use of landscape men. The book is small enough to fit the pocket and yet contains references to more than eleven hundred distinct species and varieties. All this material may be identified by keys which make use of characteristic features and therefore render long descriptions unnecessary. The keys for the most part are based on bud, leaf,

bark, and stem characters, thus enabling one to name most of the species when not in flower. The book is especially good in gardeners' forms which one encounters so frequently in public parks and large private estates. The nomenclature is in keeping with that of Bailey's "Cyclopedia of Horticulture," to facilitate reference to the latter work where additional information may be found. The book contains 200 pages and costs a dollar. It may be obtained of the author at Urbana, Illinois.

The varied colors of flowers appear upon examination to be due to a relatively small number of pigments. The dandelion and other flowers having their colors borne by small bodies in the cells called chromoplasts are colored by a substance called carotin, but those whose colors are due to pigments in the cell sap are nearly all colored by anthocyanin. The most familiar occurrence of anthocyanin aside from its presence in pink, red and blue flowers may be seen in the young leaves in early spring, in the touches of red that are found, here and there, on the leaves and stems of mature plants, in the colors that appear on almost any part of a plant when it is attacked by disease or injured by insects, and in the color that is developed on the underside of the leaves of nearly all water plants and of other leaves that last through the winter. Anthocyanin appears to originate through the oxidization of a pale yellow substance called a flavone which is not to be confused with the other yellow pigment, carotin or xanthophyll. In some way, cold influences the production of anthocyanin, and the formation of sugar in the cells appears to have the same effect. Nearly all red, blue and pink flowers are colored by anthocyanin, but study has shown that the word anthocyanin stands for a group of closely related pigments and not a single one. The anthocyanin which gives the dahlia and geranium their color is pelar-

gonidin, that of certain roses and the Centaurea is cyanidin, that of the larkspur is delphinidin and so on. Miss Muriel Wheldale of Newnham College, Cambridge, who knows more about anthocyanins than anybody else, has recently issued a book on the subject entitled "The Anthocyanin Pigments of Plants." This will prove of much interest to all whose studies lead them into this fascinating field. The first part of the book consists of eight chapters detailing the distribution, isolation, constitution, and significance of anthocyanin with an account of the chemical reactions concerned in its formation. The second part deals with the part played by anthocyanin in Genetics. There is also a bibliography of more than six hundred titles. The subject of flower color is one that we are likely to hear much more about in the future since it so frequently indicates the working of Mendel's law, and Miss Wheldale's book forms the most available introduction to the subject. The book is issued by the Cambridge University Press and published in America by G. P. Putnams Sons. New York. The price is $4.50.

The American Botanist

A Quarterly Journal of Economic & Ecological Botany

WILLARD N. CLUTE, EDITOR

SUBSCRIPTIONS.—The subscription price of this magazine is $1.25 a year or $2.00 for two years, payable strictly in advance. The magazine is not sent after subscriptions expire. Personal checks on small or distant banks must contain ten cents for collection fees. The magazine is issued on the 20th of February, May, August and November.

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THE FERN BULLETIN

In 1913, at the completion of its twentieth volume, **The Fern Bulletin** was consolidated with this magazine. The back volumes average more than 100 pages each, and since they cover the entire formative period of American Fern study they are invaluable for reference. The majority of new forms discovered in recent years have been described in its pages. First six volumes out of print. A set of vols. 7 to 20 will be sent for $8.00. An extended description of the contents of the volumes may be had for the asking.

WILLARD N. CLUTE & CO., PUBLISHERS

207 WHITLEY AVENUE, JOLIET, ILL.

ENTERED AS MAIL MATTER OF THE SECOND CLASS AT THE POST OFFICE, JOLIET, ILL.

Fruits of the Potato.

THE AMERICAN BOTANIST

VOL. XXIII JOLIET, ILL., NOVEMBER, 1917 No. 4

Red o'er the forest peers the setting sun,
The line of yellow light dies fast away
That crowned the eastern copse; and chill and dun
Falls on the moor the brief November day.

—Keble.

THE FRUIT OF THE POTATO

BY WILLARD N. CLUTE.

EVEN the botanizer is aware that the common potato (*Solanum tuberosum*) is a member of the nightshade family and closely related to the tomato, egg-plant, wonderberry, and other inhabitants of our gardens valued for their fruits, but this relationship is usually assumed from resemblances between the flowers rather than from any that may exist in the fruits, for potato fruits are rather scarce at present. A good many people probably imagine that potatoes do not produce fruits and seeds; in fact, the tubers are often regarded as a sort of seed and the term "seed potatoes" has come to be commonly used for such tubers as are used for planting. That potatoes really do produce fruits like the other nightshades may be seen from our illustration where seven fruits are shown natural size. When growing they look exactly like small green tomatoes, but unlike tomatoes they are not edible.

The potato, like various other species which multiply rapidly by vegetative means, shows a tendency to omit seed production and to depend almost entirely upon this new means of propagation and distribution. Whether the lack of fruits

is really due to this peculiarity, or whether the plant does not set abundant fruits because the proper pollinating insect is absent, is a matter about which there seems to be very little information at present. In the opinion of the writer, almost any potato plant would produce fruits and seeds if adequately pollinated.

However this may be, potato fruits, or potato seed balls as the farmer usually calls them, are not entirely absent from the plants. It is likely that a careful search in any extensive potato patch at the proper season would reveal specimens. The writer has seen them during the past summer and A. T. Cook, a seedsman of Hyde Park, N. Y., through whose courtesy we are able to reproduce the specimens shown on our frontispiece, harvested more than seven bushels this year. Mr. Cook makes a specialty of raising potato seeds for the trade.

New varieties of potatoes may originate as sports from forms already under cultivation, but waiting for vegetative sports is a wearying business when one may sow seeds and get a number of variations at once. Not all such variations are commercially valuable, however. There is likely to be a large number that are worthless for every one that shows a desirable trait. Now and then a finer form may appear. It is said that Luther Burbank got his start in life by breeding a new variety of potato, the Burbank, in this way, but it requires something more than potatoes to duplicate Burbank's successes and even potato seeds, alas, are scarce!

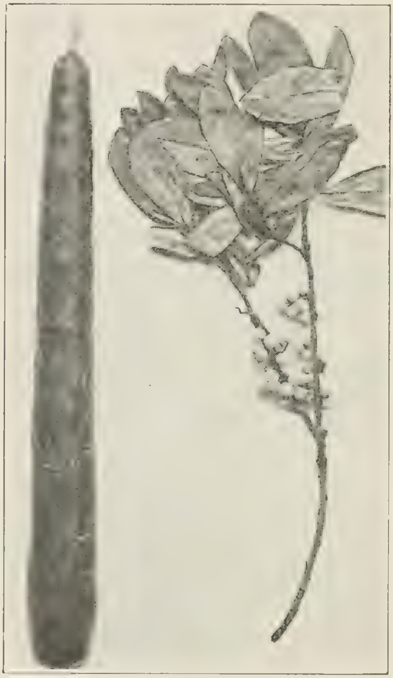
USES OF THE BAYBERRY

By Albert A. Hansen.

WHEN we contemplate the many conveniences which science, invention and modern industry have made possible, it is difficult to imagine how our forefathers were able to get along without them. Plants contributed a large share toward supplying many of the wants of the early pioneers and, curious indeed, are many of the uses to which they have been put in the past. Along the Atlantic seaboard, from Maine to Florida and rounding the coast of Louisiana, grows a plant known as the bayberry or small waxberry (*Myrica Carolinensis*), which contributed its share toward lightening the burden of living during the pioneer days. The fruits of the bayberry are covered with a grayish coat of wax, a device for protecting the berries. The early settlers depended to a large extent upon these berries as source of wax, a fact still utilized in parts of New England. The housewife was not slow to find practical use in these wax-covered berries. She tied clusters of them in little cloth bags and used them in this fashion as a means of waxing the irons with which to iron clothes. It is said this practice persists even to the present day.

Reference is frequently made in colonial literature to the christmas candle. The true christmas candle was made by dipping strings into bayberry wax, the result being a candle of handsome dark-green color. Many legends centre around these candles, one of which tells us that the burning of the christmas candles on Christmas Eve is sure to bring good fortune to the household.

The leaves of the plant also find a use. From them is brewed the decoction known as bayberry tea. This must certainly be a cheap beverage since the plant is very common. The writer noticed large quantities of bayberry along the



Bayberry Plant and Candle.

sandy beaches of New Jersey. In many towns it is the commonest ruderal in the vacant lots. It seems particularly prolific in the vicinity of Barnegat Bay.

A close relative of the bayberry, also possessing wax-coated berries, is the wax-myrtle (*Myrica Gale*), a slender shrub preferring sandy swamps and wet woods. As with its relative, the bayberry, the wax was formerly extensively used in the making of candles. Its leaves have a welcome fragrance

when crushed and the root is a strong emetic. The wax-myrtle grows abundantly along the coast from southern New Jersey to Texas.

As civilization advances and modern conveniences increase, we are apt to forget about the devious ways in which our forefathers obtained the necessities and comforts of life. and the interesting legends which surrounded many of the objects which were formerly utilized daily. Such data should be recorded before it passes into oblivion and the interesting facts thus be lost to posterity.

A NEW OAK

By James M. Bates.

As I was walking the streets of Washington in October, 1913, I found a row of shingle oaks (*Quercus imbricaria*) in front of the Treasury Building. They were the first I had ever seen in nature. Consequently I stopped to examine them and to my astonishment found one tree on which some of the leaves were entire while others had from one to three large teeth, mostly near the upper end. I immediately said "there is nothing like that in Britton & Brown, I am sure." I took three twigs and hunted for more like them. I found one more tree across the street. Two days later I took Mr. Paul Hartley of the Forest Division and pointed the trees out to him, charging him to collect more twigs with acorns the coming year for study, the late frost of 1912 having taken all the flowers of this species around Washington. I sent a photo of the twigs to Dr. Charles S. Sargent the next spring, and acting on my suggestion he also had friends collect twigs with acorns. I am not enough versed in the study of the genus to profitably describe the acorns which Mr. Hartley sent me

in due time and compare them with those of *Q. imbricaria*, leaving that to Dr. Sargent who will include the tree in his new issue of the "Trees of North America." He suggests the name of *heterophylla*, which will probably be adopted. I am merely telling the story while I can, so that others visiting Washington may, if they choose, see for themselves.

AMPHICARPAEA

By Dr. W. W. Bailey.

THE late William Whitman Bailey, for many years professor of botany in Brown University, was a facile and entertaining writer on botanical subjects and frequently favored this magazine with contributions. Among papers of this kind remaining unprinted is the one which follows upon a familiar denizen of dryish woodlands. It is a good example of the way a sympathetic treatment may make common things interesting.—Editor.

Serious fault is often found, and not unnaturally, with botanical titles. They are spoken of as long, unwieldy, barbarous, and it is asked why we do not call the plants by their common names. Certainly some appellations are ill-bestowed, and a few, fortunately a very few, are even indecent. These last, however, not being translated, pass current in most cases without a thought. Their euphony carries them as does music the objectionable words of some opera libretto.

But ill-sounding or disagreeable appellations are not confined to the Latin. A pretty little twiner extremely common in our Northern woods is known as hog-peanut. Surely its botanical name which heads this article, though at first sight formidable, is euphonious and pretty. It alludes to the two kinds of pods borne by the plant, one sort above ground, the other subterranean. The upper ones are scythe-shaped, con-

tain several seeds, and are borne on a stalk. The underground ones are pear-shaped, and usually produce but one large seed or pea. The specific name, *monoica*, that is moneocious refers to the two kinds of flowers and fruits. . The plant is a very slender and delicate looking one, the tangled stems clothed with brownish hairs intertwining into extensive beds under the low forest shrubbery.

To the writer nearly all plants of the pulse family are attractive and this one seems to him charming. It happens that at the time it flowers, in August and September, it has comparatively few companions in its chosen locations. Then, while its habit is graceful, pretty enough indeed to suggest designs for artist or decorator, the slightly pink, pea-shaped flowers in simple or compound racemes are modestly attractive. The leaves are pinnately trifoliate, very thin and easily withering, the leaflets being rhomboidal or lozenge-shaped.

It is remarkable how the papilionaceous type of flower, so pronounced and so unmistakable, can yet be so infinately varied. In the case of *Amphicarpaea* the calyx is nearly equally four-toothed, the corolla has nearly similar keel and wing petals, while the banner is partly folded around them. The stamens are di-adelphous, that is, nine in one set and one standing free.

Plants of this sort nearly always have some peculiar method of pollination but we cannot recall ever having seen the special plan of *Amphicarpaea* described or even suggested. Still, this may be a fault of memory when so much of this sort of thing has been recorded. The plant has been one of my favorites ever since I first saw a sketch of it, by my father, drawn through the text of Bigelow's "Florula Bostiensis," a book so useful to our earlier botanists. My own copy of this work is filled with neat drawings by my father, in pen and ink or pencil, which greatly enhance its value. In my earlier botanizing, I followed the same plan from New Brunswick

to California and now that my private herbarium is merged with the general one of Brown University, these, with their accompanying notes, form a pleasant record of those halcyon days.

THE HAWAI'IAN TARO

By Vaughan MacCaughey.

THE most important and distinctive crop-plant of the native Hawai'ians is the *taro* or *kalo*. This valuable aroid (*Colocasia antiquorum* var. *esculenta*) occurs in many parts of the South Pacific, and in tropical Asia, and was brought to Hawai'i by the early Polynesian migrants from the south. They were skillful and industrious farmers, and developed their primitive agriculture to a high state of efficiency.

The taro plant resembles in appearance the large caladiums or "elephant's ears" common in Eastern lawns and gardens. From the large, starchy, subterranean corm (which is the part of economic value), springs a cluster of large, sagittate leaves. The corm is usually from six to twelve inches long and four or five inches in diameter, like a large sweet potato. The petioles rise to a height of from two to four feet and the blades are from ten to sixteen inches long and eight to twelve inches broad. They are bright yellow-green and so smooth that water runs off them like quicksilver. The flowers are of the typical aroid pattern, with spadix and creamy-yellow spathe, from three to five inches high. Flowers are rare and seed production is practically unknown. Taro has been propagated for untold centuries by purely vegetative methods and like many other tropical plants (sugar cane, sweet potatoes, pineapples, bananas, etc.), has lost the seed habit.

A widely-circulated misstatement concerning Hawai'ian taro is to the effect that "there are about forty varieties." In

1913 the writer, with the invaluable assistance of Mr. Joseph S. Emerson (deeply versed in the Hawai'ian language and lore), made a careful survey of the native varieties and their names. We collected over 300 distinct varietal names in use among the natives. A certain proportion of these were synonyms and variants, but after making all due allowances and examining the native taros themselves in hundreds of plantings, we arrived at the conclusion that the primitive Hawai'ians cultivated and habitually recognized *over 200* distinct varieties and strains of taro. Much of the old culture has been wholly abandoned, and many of the varieties today are very localized, or are on the verge of extinction. The choicer kinds were raised exclusively for the chiefs and nobility and were often spoken of as "royal taro." Other kinds were reserved for medicinal use, and for religious incantations and ceremonies.

From the standpoint of cultivation the Hawai'ian taros may be conveniently classed in four groups:

1. Those raised only in upland, dryland, or unirrigated regions, *kula*.

2. Those raised only in wetlands, lowlands, or irrigated areas, *lo'i*.

3. Those raised both in wetlands and drylands. *lo'i* and *kula*.

4. Wild taros, growing in damp places and swamps in or near the forests.

The islands of Hawai'ia and Maui were famous in the early days for the excellence of their upland taros, whereas the islands of Oahu and Kaua'i, with extensive coastal plains, were devoted chiefly to the lowland kinds. Great skill was shown by the primitive Hawai'ians in diverting water from the mountain streams and leading it through ditches down to the taro lands, where the innumerable tiny patches, each

surrounded by an embankment, were arranged in a veritable patchwork of low terraces.

Taro requires about one year for maturity. When mature they are dug, the roots and leafy tops removed, and the corms washed. They are then thoroughly steam-cooked in a native underground oven; this requires several hours. The cooked corms are peeled and pounded into a soft, pasty mass. The pounding is done in a long wooden trough or "poi-board," by means of stone pestles. It is a laborious process, done by the men. Often two men work at opposite ends of the same board. The finished product is almost pure starch, and is called *pa'i-ai* or "hard poi." To this suitable quantities of water are added, as required, and it is thoroughly mixed. The resultant thick paste is the famous *poi* of Hawai'i and the South Seas. It is a staple food in the dietary of the natives. It ferments slightly and will keep a long time without spoiling. The natives store it in wooden bowls and eat it with the fingers. Large quantities are consumed at a single meal. "Fish and *poi*" is a phrase among the natives equivalent to the American "square meal."

The succulent young leaves and petioles of the taro are also cooked and eaten like spinach and constitute the delicate vegetable called *lua'u*. The general use of *lua'u* at native feasts has caused the feasts themselves to become known as *lua'us*. The taro corm is also eaten as a baked or roasted vegetable, and is often mixed with breadfruit, coconut, sweet potatoes, and other foods. It is never eaten raw, because of the irritating raphides that are only dispelled by cooking.

Due to the unsanitary conditions under which hand-pounded *poi* is often made, many persons, especially Americans, prefer the machine-made *poi*. There are several factories in Honolulu; the process in brief is as follows: The corms are washed, boiled in large drums by means of live steam

under pressure, and peeled by hand. The peeling is done by women, under sanitary conditions. The peeled corms are passed through a massive machine that resembles a huge meat-chopper set vertically. Water is added as needed, and the *pa'i-ai,* of uniform texture, comes out of the bottom of the grinder and is put into small barrels, ready for sale.

Experiments conducted at the College of Hawai'i during the past year afford instructive corroboration of the well-known high food value of taro. Chemical analyses of the raw corms, conducted according to standard technique, gave the following results:

Starch	34.12%
Sugars	1.08
Fats	1.06
Proteins	.72
Ash	.67
Crude fibre	.50
Water	59.00

Taro has a much lower moisture content than either Irish or sweet potatoes. Its fat content is higher and its protein content is lower. As to starch, taro has more than double the amount possessed by Irish potatoes, and nearly 50% more than sweet potatoes.

The starch-grains of taro are exceedingly minute (1/25,000 to 3/25,000 in diameter), very much smaller than those of the common cereals, for example. For this reason taro and *poi* are easily digested, and are commonly recommended for invalids, infants, and aged persons. Taro flour or "taroena," manufactured from the dried, ground corm, has been in local markets for a number of years.

With the many and profound economic changes that have taken place in the Hawai'ian Islands during the past century, the taro has become of rapidly decreasing importance as a food plant. The natives have diminished until there is today but

a pitiful remnant of a once splendid stock. They are the chief consumers of taro and poi; the other nationalities now dominant: American, Japanese, Chinese, Portugese, Spanish Filipino, etc., use relatively insignificant quantities. It is to be hoped that taro and its products will become more generally known to Americans, not only in Hawai'i, but also on the mainland, especially in the Southern states. Its simple culture, its comparative freedom from insects and fungous pests, its high yields per acre, its excellent storage qualities, its varied uses, and its extraordinary nutritive values, all combine to make the Hawai'ian taro a food-plant of much interest and of large economic possibilities. This is particularly true at the present time, when the attention of the nation is focused upon the conservation of food and the wheat shortage places special emphasis upon the starches.

AN INTERESTING TRILLIUM

BY L. S. HOPKINS.

IN the spring of 1917, Mr. H. G. Weisgerber of Salem, O., sent the writer a picture of a freak specimen of *Trillium grandiflorum*. As it will doubtless be of interest to many botanists, brief mention may be made of it in this publication. As shown in the illustration, the plant had four fully developed petals. It also had four sepals, four leaves, eight stamens and four divisions of the pistil. Mr Weisgerber writes of it as follows: "The plant grew behind some bushes within five feet of the path that I had travelled for many mornings during the 'bird season,' but I did not notice it until the morning of Decoration Day. When I found that I had not succeeded in getting a good negative of it, I went back the next morning intending to photograph it again and then to mutilate the

petals and thus prevent anyone from picking the flower for I wanted it to ripen its seed so that I could plant them somewhere in the woods and notice whether it would reproduce

A four-parted Trillium.

its kind, but in the meantime some vandal had taken that which I had counted as my own. I shall watch for the plant next year and see if I cannot get a better picture. A young plant right beside this one had the usual three leaves."

THE WHITE PINE BLISTER

THERE appears to be a considerable number of very destructive plant diseases in Europe which have not as yet spread to this country, but the ravages of those that have reached us are serious enough to incline us to keep the others out if possible. Two deadly fungus diseases have in recent years threatened the very existence of some of our most valued forest trees and the American Forestry Association is now endeavoring to prevent the further importation of any kind of plant in order to protect the forest from further disaster. In this they

are of course, opposed by the nursery men and florists who see in measures of this kind the threatened extinction of their own business, and the secretary of the Society of American Florists rather disgustedly inquires whether stopping the importation of Japanese lily bulbs will aid in protecting our forests.

Our most serious plant diseases have always come from abroad for the reason that our plants are not as well adapted to resist these as they are to resist those nearer home. Long ages of warfare with the latter have bred a race of plants that do not easily succumb to their attacks but such plants are often very susceptible to foreign foes. A case of this kind is found in the chestnut blight which got into this country a few years ago, on imported Japanese chestnut stock, and has already killed the chestnut tree over a large part of its range. This disease is still spreading and is now making an occasional assault on allied plants. There is no known way of stopping the disease at present and in consequence all the chestnuts and chinquapins seem to be doomed. Possibly, here and there, more resistant individuals may be encountered and if so, a new race of trees may be produced but only at the expense of much time and money and even then it would be difficult, if not impossible, to duplicate the magnificent chestnut forests of a few years ago.

The latest fungus pest to threaten our trees is the white pine blister which has already become firmly established in New England and New York with outposts as far west as Minnesota. Wherever this fungus gets a foothold, the white pines are rapidly killed. One of the interesting features of this new disease is the fact that the organism which causes it is one of those species that, like the wheat rust, lives upon more than one host in its life cycle. In the case of the wheat rust, spores formed on the previous year's wheat set up an infection in the leaves of the barberry and from the young plants on the barberry leaves the new wheat is infected. The second host

of the white pine blister is some species of currant, wild or cultivated. Spores from the pine set up their growth on currant leaves and after a time produce new spores which can cause further disease in the pines. It is believed that the spores from the plant on the pines cannot directly spread the disease to other pines but must first pass through the stage of growth on the currant. If this is so, we have one means of control which is absent in the case of the chestnut blight, for if all the currants near pine trees are rooted up, the disease is likely to die out for want of a bridge from one generation on the pine to another. Unfortunately the destruction of the currants runs counter to the nurseryman's interests again, and it becomes a question in some localities whether to save the currants and let the pines die, or to save the pines by uprooting the currants.

While the white pine of the eastern States is the only species threatened at present, the disease is believed fatal to all members of the white pine group--that is, to all pines with five needles in a bundle. There are several species of this kind in the western part of our country and it is important to check the disease before these, also, are attacked. It is expected that the national government will appropriate a certain sum for the eradication of the disease and several States in which the forests are threatened will probably do likewise. It will be only by the most prompt and energetic action that the trouble may be controlled.

A NOVEL JUNIPER TREE

By H. E. Zimmerman.

IN Dauphin County, Pennsylvania, is found an interesting variety of a juniper which grows only about two feet high. Scientists who have visited the tree say it is a specimen of the prostrate juniper. The tree is 130 feet in circumference, covering over 1600 square feet of space. The accompanying picture shows the interwoven branches as they spread out from the root or main stem in different directions over the ground. The limbs do not take root as would be supposed. The owner of the farm where the tree grows says that 60 years ago it was known to be only about the size of an ordinary wagon wheel. The tree therefore is thought to be about 75 years of age. As this is the natural way for this tree to grow, it can not be called a freak. There are five varieties that grow this way, but they differ only in minor particulars from this variety.

FOOD FROM WILD PLANTS

By Willard N. Clute.

THE native plants of North America have been drawn upon very little as sources of human food. It is true that America has given the three staple crops—corn, potatoes and beans—to the world, but these are crops originating in warmer regions and it is still true that practically all the crops we cultivate in the United States are of Old World or Tropical origin.

It may be questioned, however, whether the fact that our garden and field crops originated elsewhere proves that we have no plants that would yield as valuable returns if improved by cultivation. It is probable that our cultivated plants are mostly of European origin simply because the settlers of this country came from that part of the world. The Indians, as everyone knows, found a large amount of vegetable food in the forests and swamps and it is likely that many of these would prove important food crops for the race that succeeded them, if properly cultivated. As a matter of fact; several such plants in their primitive condition are utilized at present, notably various nuts, berries, and other wild fruits.

An investigation of the subject has shown that there are more than two hundred kinds of wild plants, mostly in the eastern half of our country, that may be used as food. These are included in the following list. The list is undoubtedly far from complete but it is published as the basis for further work and all who can are invited to add to it. When all the plants of our western and southern states have been added, it is pos-

sible that the number of edible species may be doubled. At the present time, when a scarcity of many foods is threatened, it behooves us to investigate all possible sources of supply.

OSMUNDACEAE.

Osmunda cinnamomea. CINNAMON FERN. The bud at the base of the fronds in this species and in *O. Claytoniana* is sweet and edible with a flavor of chestnuts. Often called "heart of Osmond." Secured by pulling up the fronds *en masse.*

Osmunda regalis. ROYAL FERN. Young fronds used like asparagus.

PARKERIACEAE.

Ceratopteris thalictroides. FLOATING FERN. Reported to be used as a potherb in the warmer parts of the earth.

POLYPODIACEAE.

Onoclea struthiopteris. OSTRICH FERN. Young fronds may be used like asparagus.

Pteris aquilina. BRACKEN. Young shoots eaten like asparagus.

Nephrodium filix-mas. MALE FERN. This and *N. marginale* are officinal drugs.

TAXACEAE.

Taxus Canadensis. AMERICAN YEW. The scarlet arils of the seeds are edible. Seeds reported to be poisonous.

PINACEAE.

Pinus edulis. PINON PINE. The seeds of this species are the pinon nuts of the markets.

Pinus monophylla. NUT PINE. This species also a source of pinon nuts.

Pinus sabiniana. DIGGER PINE. Another western species whose seeds are edible and large enough to be worth gathering.

Pinus Lambertiana. SUGAR PINE. Seeds edible. Several other species of pine yield edible seeds.

Picea mariana. BLACK SPRUCE. Spruce beer made from the twigs. Wood used in violins and other musical instruments.

Picea abies. NORWAY SPRUCE. Resin is the source of Bergundy pitch.

Abies balsamea. BALSAM. Resin is the familiar Canada balsam.

Larix Americana. AMERICAN LARCH. The larches yield Venice turpentine.

Juniperus Virginiana. RED CEDAR. Berries used to flavor gin. Wood used in pencils and for making moth-proof chests.

TYPHACEAE.

Typha latifolia. CAT-TAIL. Bread may be made from the abundant pollen of this species and *T. angustifolia.* Down of the fruits used for stuffing cushions. Leaves once used for bottoming chairs.

ALISMACEAE.

Sagittaria latifolia. ARROW-HEAD. Produces edible tubers, often as large as the fist. Called "duck potato." An excellent food plant for swamps and marshes where other food plants will not grow.

Sagittaria graminea. ARROW-HEAD. This species, *S. heterophylla,* and probably others produce edible tubers worth cultivating.

Alisma plantago. WATER PLANTAIN. According to Lounsberry (Guide to the Wildflowers) "the corm-like tubers are eaten by the Kalmucks."

GRAMINEAE.

Zizania aquatica. WILD RICE. Seeds (fruits) used like the common rice. A promising crop for shallow waters in the Northern States.

Glyceria fluitans. MANNA GRASS. Seeds whitish, edible.

Arundinaria macrosperma. Large Cane. Stems used for fish-poles.

CYPERACEAE.

Cyperus rotundus. Chufas. Tubers very sweet and edible. Occasionally cultivated.

Cyperus esculentus. Nut Grass. Similar to the preceding but found farther north.

Scirpus pungens. Bull-rush. Once much used in making rush-bottomed chairs. *S. validus* probably had the same uses.

Carex sp? Sedge. Certain unidentified sedges are used for making mattings and light furniture.

ARACEAE.

Arisaema triphyllum. Indian Turnip. Corm acrid when fresh, but edible when dried or boiled. "Portland sago" is made from an allied European species.

Arisaema dracontium. Green Dragon. May be used like the preceding species. An excellent food crop for moist shades.

Calla palustris. Wild Calla. Rootstock reported to be made into bread by the Laplanders.

Orontium aquaticum. Golden Club. Rootstocks edible when roasted. Seeds cooked like peas. The plant was once extensively cultivated by the Indians of the Eastern States. A good crop for lake borders and other shallow waters.

Acorus calamus. Sweet Flag. Rootstock warmly aromatic. Often cut in slices and candied. Fruit spikes also edible. Officinal.

BROMELIACEAE.

Tillandsia usneoides. Spanish Moss. The tough stems used like tow and horsehair in upholstery.

LILIACEAE.

Allium tricoccum. LEEK. Young bulbs tender, sweet, and well flavored, surpassing the cultivated onion in these respects.

Yucca glauca. SPANISH BAYONET. Roots used as a substitute for soap.

Yucca Mohavensis. WILD DATE. Fruit edible. Stem yielding soap.

Yucca baccata. SPANISH BAYONET. Fruits edible.

Smilacina racemosa. FALSE SPIKENARD. The thick rootstocks a possible source of starch. Young shoots reported to be eaten like asparagus.

Polygonatum biflorum. SOLOMON'S SEAL. Young shoots of this and *P. commutatum* reported edible. Rootstocks a possible source of starch.

Medeola Virginica. CUCUMBER ROOT. The short rootstocks tender and edible with the flavor of cucumbers.

Camassia esculenta. WILD HYACINTH. Bulbs edible. A favorite food of the Indians. A possible food crop for undrained lands.

Camassia quamash. CAMASS. A species of the Northwest allied to the preceding and used like it.

Erythronium Americanum. ADDER'S-TONGUE. Leaves reported in Garden and Forest as a potherb. Doubtful but worth investigating. Bulbs possibly edible.

Chlorogalum pomeridianum. AMOLE. Bulb yields soap.

Calochortus amabilis. YELLOW GLOBE TULIP. Bulb edible.

Brodiaea capitata. WILD HYACINTH. Bulbs edible. Called grass nuts.

Calochortus macrocarpus. MARIPOSA LILY. Bulbs edible and well flavored; much in demand by the aborigines.

SALICACEAE.

Salix viminalis. BASKET WILLOW. Young twigs used for basketry furniture and for withes for tying up the vines in vineyards. Wood makes a good charcoal for use in gunpowder.

Salix sp? WILLOW. Bark of several species yield salicin used in medicine. Bark sometimes used for smoking.

Populus balsamifera. BALSAM POPLAR. This species and the variety *candicans* yields a fragrant resin much used in domestic remedies.

MYRICACEAE.

Myrica cerifera. WAX MYRTLE. Fruit covered with a whitish wax used in making candles.

Myrica Carolinensis. BAYBERRY. Like the preceding, yields wax for candles.

JUGLANDACEAE.

Juglans cinera. BUTTERNUT. Nuts edible. When green used for pickling. A salad oil may be expressed from the kernels and the rind of the nut yields a good brown dye.

Juglans nigra. WALNUT. Like the butternut, yields oil and dye. Wood valuable for cabinet work.

Carya Illinoensis. PECAN. Until recently the wild trees were the only source of these well known nuts.

Carya ovata. SHAG-BARK HICKORY. Nut edible.

Carya laciniosa. KING-NUT. The largest of the hickory nuts.

Carya glabra. HICKORY. Young twigs used for coarse brooms.

BETULACEAE.

Corylus Americana. HAZEL-NUT. The fruits of this and *C. rostrata* much like filberts.

Betula nigra. RIVER BIRCH. Twigs used for brooms.

Betula lenta. BLACK BIRCH. Bark yields an aromatic oil which is identical with that distilled from wintergreen. Sap sweet.

Betula lutea. YELLOW BIRCH. Yields much sweetish sap in spring. Bark shaggy, containing sufficient oil to make it good kindling on a rainy day.

Betula alba. PAPER BIRCH. This species and its varieties well known for their papery bark used for numerous fancy articles. Wood used for shoe-pegs, spools, button molds, and various other things.

Alnus incana. ALDER. The catkins of this and other species yield a brownish dye.

FAGACEAE.

Fagus grandifolia. BEECH. The small though sweet nuts edible.

Castanea dentata. AMERICAN CHESTNUT. A highly valued nut.

Castanea pumila. CHINQUAPIN. A small nut similar to the chestnut found in most of the Southern States.

Quercus velutina. BLACK OAK. Bark yields a yellowish dye and much tannin.

Quercus sp? OAK. The fruits of several species of oak may be used for food and the bark of the trees are used for tanning.

URTICACEAE.

Ulmus fulva. SLIPPERY ELM. Inner bark yields abundant mucilage.

Celtis occidentalis. HACK-BERRY. Fruit covered with a thin sweet and edible rind.

Humulus lupulus. HOP. Young shoots may be cooked and eaten like asparagus.

Maclura pomifera. OSAGE ORANGE. Wood hard and elastic. Once used by the Indians in making bows. Heart

wood yields a good yellow dye. Leaves are a favorite food of the silkworm.

Morus rubra. RED MULBERRY. Fruit valued for pies. Leaves used to feed silkworms.

Urtica dioica. NETTLE. Stems produce a serviceable bast. Young tips used as a potherb. Probably other species may be used as food.

ARISTOLOCHIACEAE.

Asarum Canadense. CANADA GINGER. Rhizomes with a ginger-like flavor, edible.

POLYGONACEAE.

Rumex crispus. CURLED DOCK. Leaves used as a potherb.

Rumex patientia. PATIENCE DOCK. Leaves used like the preceding.

Rumex hymenosepalus. CANAIGRE. Stems used like the cultivated rhubarb. Roots yield much tannin of commercial value.

Rumex acetosa. SORREL. Leaves used as a salad.

Polygonum sp. SMARTWEED. Several species of smartweed have numerous large seeds and it is likely that grains little inferior to buckwheat might be developed from them.

CHENOPODIACEAE.

Chenopodium album. PIGWEED. Young plants used as a potherb.

Chenopodium Californicum. SOAP PLANT. Root saponaceous. Seeds edible, used like the tropical quinoa.

Chenopodium Fremonti. Seeds used like those of the preceding.

Atriplex patula. ORACH. Young plants used as a potherb.

AMARANTHACEAE.

Amaranthus paniculatus. PRINCE'S FEATHER. Seeds used by the Mexicans as food.

PHYTOLACACEAE.

Phytolacca decandra. POKE WEED. Young shoots used as a potherb. Roots deadly poisonous. Berries once used as a source of ink and pies are reported to have been made of them.

CARYOPHYLLACEAE.

Saponaria officinalis. BOUNCING BET. Roots yield saponin in considerable quantity.

PORTULACACEAE.

Montia perfoliata. INDIAN LETTUCE. Leaves and young shoots used as a salad or potherb.

Calandrinia caulescens. WILD PURSLANE. Plant used as a potherb.

Lewisia rediviva. BITTER-ROOT. Roots eaten by the Indians.

Portulaca oleracea. PURSLANE. Plant used as a potherb.

Claytonia Virginica. SPRING BEAUTY. The starchy tubers of this species and of *C. Caroliniana* are edible.

NYMPHAEACEAE.

Nymphaea advena. SPATTERDOCK. Rootstocks roasted and eaten by the Indians.

Castalia tuberosa. WHITE WATER LILY. Rootstock producing starchy tubers of considerable size which are said to be edible.

Nelumbo lutea. LOTUS. Seeds sweet and edible. Called "water chinquapin." Rootstock producing edible starchy tubers.

(To be Continued.)

NOTE *and* COMMENT

A Remarkable Grass.—One of the most remarkable grasses that I have encountered in the course of many years' collecting was found on ballast at Linnton, Oregon, in August, 1915. It was not in flower when first observed, and only an expert agrostologist could have suspected that it was a grass at all. I was inclined to surmise that it was a *Juncus* of some sort, though it lacked the dark green color characteristic of that group. At a later visit it was found in flower, but the aspect was none the less striking and unfamiliar. It had a few short, stiff, prickly-pointed leaves near the base, and a long, leafless, flexuous *solid* culm, without nodes. The inflorescence, contrary to all accepted rules for the grass family, was lateral instead of terminal, and the long naked culm above the panicle terminated in a sharp point. The stems were as elastic and tough as steel wire, and made it most difficult to handle in press and while mounting. It was finally identified by Professor A. S. Hitchcock as *Eragrostis cyperoides* (Thunb.) Beauv., assigned by Stapf in the *Flora Capensis* to "shifting sands and sand-dunes, Cape Colony and German Southwest Africa". According to Professor Hitchcock, it has never before been reported from the United States, or from any other region than the one above named. Its remarkable elasticity would enable it to keep its culms above the surface of the most shifting and unstable sand-dune, and it might prove very useful as a sand-binder. It covered a large area the first season, but entirely disappeared

during the winter, and has not been seen since. How it came there I cannot explain, as no other South African plant has been found on this area.—*Prof. J. C. Nelson, Salem, Oregon.*

Cold and Color.—It has often been noticed that at the approach of cold weather, plants with red in their tissues tend to deepen in color. During a cool spring, even white flowers incline to a rosy tinge and plants with ordinary pink or pinkish flowers take on a more vivid tone. The red hues in flowers are almost always produced by a substance called anthocyanin which occurs in plants combined as a glucoside. Glucosides are substances which may be split up into sugar and some other substance. Thus chromogen split from a glucoside forms anthocyanin by oxidation. It is well known that cool weather checks the formation of starch and causes the food made by plants to accumulate in the form of sugar. A cool spring, therefore, makes more color in plants by causing an excess of sugar with the consequent formation of more anthocyanin. The same effects are caused by the increasing coolness of autumn days.

The Sycamore.—There are two species in our flora incorrectly called sycamore. One of these is the Norway maple (*Acer pseudoplatanus*) and the other is the buttonwood (*Platanus occidentalis*). The true sycamore which a certain biblical character, Zaccheus, is said to have climbed, is a fig (*Ficus sycamorus*). A number of fig trees have palmately-veined or plamately-lobed leaves and it is quite likely that our misnamed trees received their appellations from a fancied resemblance of their leaves to those of the true sycamore. In the early days of botany, it was customary to consider the European plants identical with those described from the Levant, by the Greeks and other early writers and many incongruities in plant names may be traced to such sources. We may get a hint of how frequently one plant was named for its resemblance to another by noting that the specific name of the Norway maple (*platanoides*) means resembling a plane tree (*Platanus*).

Death of William A. Terry.—We record with regret the death of William Almeron Terry which occurred at his home in Bristol, Conn., on October 31, 1917. Mr. Terry was born in Bristol, October 14, 1828, and was thus nearly ninety years old at the time of his death. He was best known to science as a student of the diatoms and allied plants though he was also interested in general botany and was long a subscriber of, and contributor to, this magazine. In his early days, Mr. Terry, like so many others in his part of the world, was a clock-maker. He invented a calendar clock of much merit which has since been manufactured by the Ansonia Clock Company. Later he was successively a melodeon tuner, a photographer, and a florist. After retiring from business, Mr. Terry devoted himself largely to microscopic work and his untiring efforts in the study of the diatoms resulted in the discovery of numerous new species and varieties which made his name well known to scientists on both sides of the globe.

Relation of Age to Distribution.—It needs only a slight knowledge of botany to enable one to appreciate in a general way the fact that the age of a species must often be rather closely connected with its distribution. If there are no natural barriers to the spread of a species, the wider it is spread, the older it is likely to be. There are many reasons, however, for assuming that the most wide-spread species are not the oldest. In the first place, all plants have not equally effective means for dispersal. Some are distributed by the wind, others depend on the services of birds or mammals and still others have adopted methods that are much slower—the osage orange (*Maclura pomifera*) for instance. Again, herbs, owing to the short period required for coming to maturity and producing seeds are able to spread much more rapidly than trees and also to change more quickly in response to the surroundings than are woody plants, and yet the trees are considered to be older than the herbs; in fact the herbs are thought to be descended

from trees. The early vegetation of the earth appears to have been almost entirely arborescent and the herbs are newcomers on the planet. Although the "age and area" hypothesis will not apply in all cases it may be of use in comparing two species with equally effective means of dispersal. In such cases the one with the greatest range might properly be regarded as the oldest.

Honey-bee Pollinating Ambrosia. — During certain early morning walks in the beginning of August at Greencastle, Indiana, I had occasion to observe the part played by the honey-bee in the pollination of *Ambrosia,* which struck me as peculiarly interesting. On these particular mornings, about 7 a. m., the air was very warm and still. Where the road traversed a certain declivity in the lee of a hedge of tall osage orange it was fringed on one side by a dense growth of *Ambrosia trifida,* the common rag-weed, and on the opposite side by *Ambrosia artemisiaefolia,* the smaller rag-weed. The honey-bees were particularly numerous about the flowers of the ambrosias and I noticed that as a bee would hover close to the long dense staminate flower-clusters the masses of yellow pollen were blown out in clouds by the fanning of the bee's wings. Whenever a bee attempted to alight on a flower-cluster heaps of pollen were jarred loose as the bee struck the stalk. The air being very still the clouds of pollen settled gently down on the foliage and on the pistillate flowers in the upper leaves, much of the pollen floating off and falling upon the neighboring plants, cross-pollination being thereby effectually brought about. As I gazed over the whole patch of rag-weed against the sunlight, puffs of pollen could be seen here and there where the bees were among the flowers. It seemed to me that the honey-bee in this case acted as a very efficient agent of pollination, all the more so as the rag-weeds are adapted more especially to wind-pollination. A few days later when a wind was blowing hardly a bee was to be seen among the rag-weeds.

As an object lesson to the young student of Nature the observation was not without interest.—*A. M. Johnson, University of Minnesota.*

Pith Rays a Misnomer.—Students of plant anatomy are familiar with the white glistening lines radiating outward through the wood which are commonly called medullary rays or pith rays. In quarter-sawed lumber, it is these so-called pith rays that give the "silver grain" to the wood. The rays, as their name indicates, are often regarded as layers of pith cells squeezed together by the developing woody bundles, but this appears to be a mistake. In the wood of the fossil *Lepidodendrons,* which flourished when the coal measures were being formed, the primary wood, which of course is next to the pith, does not possess these rays while in the secondary wood, at some distance from the pith, they are very conspicuous. This arrangement is also found in other stems. It therefore appears probable that we are incorrect in calling them pith rays. Jeffrey suggests that they be called wood rays. The principal function of these rays seems to be that of storage.

Partridge Berry.—At the wood's edge, frequently almost concealed by white pine needles, the shining round leaves and bright red berries of this dainty trailing vine may be found all winter. During the last warm days of the year it may be gathered for a winter bouquet. If a small fish bowl be filled with the delicate sprays with many of the berries placed near the glass, the bowl after watering may be turned upside down on a glass plate and if the room is not too warm this little trailer of the woods will keep fresh until the spring flowers come. *Mitchella repens,* the partridge berry, was named for Dr. John Mitchell a botanist of Virginia and a correspondent of Linnaeus. The common names suggest that the berries have attracted the greatest amount of attention. In addition to its best known name it has been called groundberry, squaw-berry, checker-berry and twin-berry, the last

name in allusion to the fact that the ovaries of two blossoms coalesce into one berry. It is to be regretted that so few people know the pink and white fragrant flowers which speckle the ground in midsummer. They wither very soon if picked; even in their wild home the shortness of their life is surprising. Late in June the corolla opens for a few days, early in July the green berries are in evidence, but not until October do we find ripe berries. Occasionally an unusually large berry appears, formed by four flowers, and sometimes tiny green leaves grow out of the berry. — *Nell McMurray, Clearfield, Pa.* [Another name for *Mitchella* is eye-berry in allusion to the eye-like remains of the calyx on the apex of the fruit. This, however, is not characteristic merely of the partridge berry but is found in many other species of the Rubiaceae and Caprifoliaceae.—Ed.]

EDITORIAL

Although the subscription price of this magazine was raised to $1.25 at the beginning of the present year, we did not raise the price to old subscribers. All on our list last January will be billed at the dollar rate as long as they remain subscribers. To new subscribers, however, the price is $1.25 a year or two years for $2.00 in advance. New subscribers may secure the magazine at the dollar rate by becoming "permanent" subscribers, that is by paying for two years in advance and asking to have the magazine sent until they order it stopped. Thereafter they may pay at the dollar rate at any time during the year and thus be sure of receiving each number as issued. Becoming a "permanent" subscriber does not imply a subscription for any definite length of time, but it does carry with it a promise to pay for all copies until the subscription is ordered stopped. Nearly half of our subscribers are on the permanent list and we recommend this method of subscribing to others.

* * *

In this issue we publish the first part of the list of wild plants which are edible or which produce edible parts. There is no doubt that the list can be greatly extended and we especially invite additions from members of the Botanical Observation Club. It will be well to include, also, plants known to yield fibers, soaps, and dyes, but not drugs. There are a large number of plants with tonic, astringent, demulcent and other properties useful in medicine, but the medical profession have already investigated all that appear to be of value, though there

are some that may be substituted for better kinds should the supply of the latter fail. Material is accumulating for the list of plants with disagreeable odors. This will probably be published in the next issue. We purpose dividing it into the plants with ill-scented flowers and those with foliage of a disagreeable odor. Notes from all are desired. There are no dues nor fees in the Botanical Observation Club. Anybody interested in any subject that comes up for discussion is invited to add his observations.

* * *

The ingenious plan to encourage war savings which our government has just inaugurated makes it possible for every person in the country to join in the war loan and, therefore, deserves to be enthusiastically supported. Thrift stamps, costing 25 cents each, and war savings stamps, costing $4.12 now and one cent a month extra for each succeeding month of 1918 have been issued and may be purchased nearly everywhere. The thrift stamps do not bear interest, but when $4.00 worth have been secured, they may be exchanged for a war savings stamp by paying the extra few cents and this latter stamp bears interest at 4%, compounded quarterly. Subscriptions to this magazine may be paid in thrift stamps and all orders for back numbers may be paid for in war savings stamps.

BOOKS AND WRITERS

In response to inquiries, we report that the "1917 Official Code of Standardized Plant Names," issued by the American Joint Committee of Horticultural Nomenclature, mentioned in our August number, may be obtained of the secretary, Harlan P. Kelsey, Salem, Mass., for 25 cents a copy. The Code contains about 3500 plant names with those that the Committee propose to use starred. Since these names are likely to be used in future by the makers of seed catalogues and the like, the

entire list will prove of value. The Committee is now at work on a list of common names to be used and the editor of this magazine has been invited to assist in this work.

A second printing of Julia W. Henshaw's "Wild-flowers of the North American Mountains" has just appeared from the press of Robert McBride & Co., New York. This book was originally issued in two bindings, one for use in Canada and the other for the United States, the latter is doubtless more familiar to American readers under the title of "Mountain Wildflowers of America." The new issue is very similar in appearance to the old. It covers 375 pages and contains 20 colored plates as well as 65 others in black and white which are exceptionally fine examples of their kind. The flowers, as in so many popular manuals, are arranged according to color, and to these a number of ferns have been added. There is also a so-called Key but this is better called a conspectus since it would be practically impossible to trace an unknown specimen by its use. In the matter devoted to each species, the plant is first described in rather technical language and then follows considerable matter of a more popular nature in which a number of related plants not described in the text are mentioned. To all interested in naming the conspicuous plants of the northwest, the book should be an invaluable aid. The price is $3.00 net.

"Around the Year in the Garden" by Frederick Frye Rockwell, is a different garden book from the usual run of such publications. It begins with the first week in January and runs through the year, discussing under each successive week the things about the garden which need attention at the time. It is not one of the "how-to-make-a-garden" books exactly, though one who reads it carefully should know what proper garden procedure is, nor is it a mere calendar of garden operations for each week in the year. So

far as the reviewer can discover, the division of the contents into weeks is largely to provide convenient pegs to hang various valuable observations upon. These range all the way from tools and labels, to laying out roads, grading lawns, irrigating, building greenhouses, caring for house-plants, and nearly everything else upon which the beginning gardener is likely to need advice. There are 350 pages and 51 plates in the book. It is published by the Macmillan Company and costs $1.75.

Harriet L. Keeler's new book, "The Wayside Flowers of Summer", is similar in style to "Our Early Wildflowers" issued last year and evidently a companion volume. It treats of the more conspicuous summer flowers under the headings; roots, stems, leaves, flowers, calyx, corolla, stamens, pistils, and fruit, and follows this with the items of popular interest which we have come to expect in flower books of this kind. There are many illustrations in the text as well as a number of full page plates, some of which are in color. The text is well done and the illustrations good, in fact it is in the author's characteristic manner which has become so well known that to say it is another Keeler book exactly describes it for a large number of readers. It is published by Charles Scribner's Sons at $1.65 net.

The task of the reviewer is often a thankless one. He owes a service to both readers and author, and unless he is constantly and squarely on the job, the interests of one or the other are likely to suffer. There recently passed away a botanist who in his time reviewed many books in the public prints but who was so kindly disposed toward all sincere attempts at helpful book-making that he could not bring his pen to condemn any of them and, as a result, his observations could not be relied upon in selecting volumes for one's own library. There are times, however, when no praise is

due. This appears to be the case with the third volume of the Pocket Garden Library, published by Doubleday Page & Co., which is labelled "Garden Flowers of Autumn". We have never seen a book that contained as many errors in a similar number of pages. To begin with, the book is not representative of its subject, since the strictly autumn-flowers are not selected. Such typically spring-flowering species are barberry, spicebush, pyrethrum, bugbane, flowering dogwood, burning bush, privet, magnolia and ninebark appear in the list. Nor are the colored representations of the flowers any better. The heath aster is colored a deep blue, the ninebark is bright red, the gingko has yellow leaves and a twig bare of leaves, flowers, or fruit is labelled dogwood. It is no exaggeration to say that many of the illustrations are inferior in coloring to similar work produced in any good grammar school. Of the smoke bush, we learn that the flowers are purple, and the rudbeckia appears as cornflower instead of cone-flower. The publishers intimate that they have sold more than 300,000 copies of this set. Perhaps they have; we paid $1.00 for the review copy here mentioned.

The strawberry is about as widely distributed as any single genus could well be, since it grows from Lapland and the Shetland Islands to Spain, Sicily, and Greece and across Asia north of the 60th parallel of latitude as well as in the western hemisphere from Alaska pretty nearly to Cape Horn. Three of the four types from which the cultivated berries have sprung—*Fragaria Virginica, F. Chiloensis* and *F. Vesca*—grow wild in America, the first being the common wild strawberry of eastern America and the last its European counterpart which has become naturalized on this side of the world. From these, and from *Fragaria elatior,* a species of central Europe, have sprung a vast number of named varieties, 1,879 of them being of American origin.

Not all of these varieties have persisted in cultivation, though enough are grown to produce a crop worth more than $20,000,000 annually. One of the improvements over the wild berry has been an enormous increase in size. Some specimens on record measured more than a foot around them. Thomas Meehan, the well known botanist, said that they "might easily be mistaken for tomatoes by a near-sighted observer". Eleven such berries make two quarts. An immense amount of other information of this nature is to be found in S. W. Fletcher's "The Strawberry in North America" issued by the Macmillan Company. It gives the history of strawberry growing and breeding from the beginning of the industry in this country and forms a companion volume to the same author's "Strawberry Growing" which treats of commercial methods. The present volume discusses the work of the early breeders and describes the rise of the industry. It is a very interesting and entertaining volume and all who grow berries either for commercial or for home use will find much of value in it. It contains more than 200 pages and costs $1.50.

Most of the facts upon which Royal Dixon and Franklyn E. Fitch have built their book on "The Human Side of Trees" are well known to botanists, but it is not likely that any plant student would subscribe to the inferences drawn therefrom. It is certainly not literally true that trees build cities, or pay attention to the styles, or get an education, or keep a diary, or travel or go into business, though being living things they may happen to be so adjusted to their surroundings as to appear to use intelligence in their activities. If one can only keep in mind the fact that plants cannot think or reason, that the acts attributed to them are not conscious processes, the "Human Side of Trees" may serve very well to call attention to many remarkable things about them. We must take ex-

ception, however, to the statement that the purple sarracenia's pitchers are filled with clean delicious water, that the sap of the cow-tree "has not only the exact appearance but all the qualities of cow's milk," that there is any tree that yields wine, that the "razor tree of South America" is covered with "terrible razors," or that one of the South American acacias gives an electric shock on being touched. Nor are we quite satisfied with the following: "Even scientists admit that trees have their laws of marriage and courtship. The Indian fig tree is such an ardent lover that he will actually take on the form of a vine if his mate chances to grow a distance from him and by this means reach out his arms that he may embrace her and powder her face with his perfumed pollen. It is not uncommon in a great forest to see trees affectionately embracing each other. Not a few trees have become extinct as a result of intermarriage with foreign trees or different species." If this is so, then we have not studied our botany to any advantage thus far. Somebody is certainly twisted. The book will prove interesting reading but let the reader be on his guard! The illustrations, of which there are a considerable number, are excellent. The book is published by the F. A. Stokes Co., New York, at $1.60 net.

THE AMERICAN BOTANIST

A QUARTERLY JOURNAL OF ECONOMIC AND
ECOLOGICAL BOTANY

EDITED BY WILLARD N. CLUTE

Volume XXIV

JOLIET, ILL.
WILLARD N. CLUTE & CO.
1918

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ILLUSTRATED ARTICLES MARKED WITH A STAR (*).

NOTE AND COMMENT

Vol. 24. No. 1 Whole Number 116

THE AMERICAN BOTANIST

FEBRUARY, 1918

35 Cents a Copy; $1.25 a Year

WILLARD N. CLUTE & CO.

JOLIET, ILLINOIS

The American Botanist

A Quarterly Journal of Economic & Ecological Botany

WILLARD N. CLUTE, EDITOR

SUBSCRIPTIONS.—The subscription price of this magazine is $1.25 a year or $2.00 for two years, payable strictly in advance. The magazine is not sent after subscriptions expire. Personal checks on small or distant banks must contain ten cents for collection fees. The magazine is issued on the 20th of February, May, August and November.

BACK NUMBERS.—Volumes 1 to 10 inclusive consists of 6 numbers each, Vols. 11 to 13 of 5 numbers each and all later volumes of 4 numbers each. The first 18 volumes may be had for 75 cents a volume, or the set will be sent for $9.00. The next 4 volumes $1.00 each or the set for $3.25. A full set contains 2968 pages.

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207 WHITLEY AVENUE, JOLIET, ILL.

ENTERED AS MAIL MATTER OF THE SECOND CLASS AT THE POST OFFICE, JOLIET, ILL.

Pasque Flowers.—*Anemone patens.*

THE AMERICAN BOTANIST

VOL. XXIV. FEBRUARY, 1918 No. 1

The snowbird twittered on the beechen bough,
And 'neath the hemlock, whose thick branches bent
Beneath its bright cold burdēn, and kept dry
A circle on the earth, of withered leaves,
The partridge found a shelter.

—Bryant.

PASQUE FLOWERS

BY MRS. BLANCHE H. SOTH.

WHILE flower lovers of the East are scouring the woods for the first hepaticas, devotees of nature in the Mountain States are seeking "anemones". They bloom even earlier than the hepaticas, but like them, are found only on the south-east slopes and they have the same habit of blooming before the leaves expand. Botanists claim that pasque flower is the proper name for the plants and that they should be classed as a separate genus from the true anemones because the styles are persistent and become greatly elongated and feathery in fruit. These beautiful plumose seed heads have caused the plant to be dubbed ground clematis in some parts of the country.

The name *Pulsatilla hirsutissima* (Pursh) seems to be favored by most authorities, but it is synonymous with *Anemone patens, A. Nuttalliana* and *Pulsatilla patens. Pulsatilla* and *Anemone* have the same significance—"shaken by the wind"—hence the name windflower because it blooms at

the windy season. Pasque flower refers to its habit of blooming at Easter-tide.

This is the same plant that blooms on the prairies as far east as Wisconsin, where it is occasionally known as rock flower. It is the State flower of South Dakota. The children often call it the gosling plant because of the thickness of its soft silky down. This soft fuzziness is to protect it from dryness and from pilfering insects, rather than from the cold of the inclement March weather. Pliny declared that only the wind caused anemones to open but we have learned that like other plants which spring up so quickly from the roots in early spring, they are stimulated to development by the moisture that reaches their rootlets; hence they will sometimes bloom after rainy weather in the fall, especially if abundant showers follow a long drouth. I have several times found perfect long stemmed pasque flowers in the Colorado mountains in September. The five to eight petal-like sepals are blue or purplish on the outside but almost white within and open only far enough to expose the ring of many golden stamens.

Mrs. Henshow tells us that the legend of the birth of the anemone was that Venus in her grief over the death of Adonis shed "tears amain" from which sprung "gentle flowers."

> "Where streams his blood, there blushing springs the rose
> And where a tear has dropped, the windflower blows."

Pasque flowers are as dear to the hearts of the children and nature lovers of the Mountain States as the first spring blossoms of any other part of the country are to its inhabitants. They are a favorite subject for artistic efforts also, and photographs and paintings of them are almost as abundant as the blossoms themselves. Plaques and plates are adorned with them oftener than with any other flowers, except the blue columbine, and their soft blues and grays are so beautiful that even the efforts of the novice are creditable.

ODOROUS FLOWERS OF TEXAS

By Cecilia A. Middlebrook.

I have divided the odorous flowers of this region into two groups: in the first, placing those flowers about which there is a difference of opinion as to whether they are pleasant or disagreeable, and in the second, naming those whose scent is compelling as to its sweetness.

Verbena bipinnatifida is the earliest in class 1. To some its odor is unpleasant, but others do not find it so. Perhaps its early beauty makes a too refined distinction seem ungrateful. Closely following it in blooming period, from about the latter part of March to the second or third week in April, according to the season, comes *Amsonia Texana,* reminiscent of tobacco, not sweet nor yet repellant. It paints charming patches of pale blue on top of the limestone uplands here.

About the same time in the lowlands, or on the high banks of streams, the air is sure to be heavy with the emanation of the wild plum blossoms, whose agreeableness to me is determined by the softness of the breezes. Gently blowing in fitful puffs, they carry the spirit of spring delicately embodied, but sometimes they appear to be stirring with the very grossness of its weight. Perhaps a little later, bordering the streams, *Amorpha Texana* may be waving its sticky purple fingers in the air or laving them in the water as if to remove the varnishy odor. The glands of *Cassia marilandica* blooming in the summer smell somewhat like it.

June sees the erection of countless pagodas of *Monarda aristata* and the incense pouring forth from them appeals to

lovers of that kind of offering. *Pycnamthemum* I would recommend to the leatherworkers' guild as a floral symbol, for to me its odor immediately recalls new leather, rather pleasant than otherwise, I think. The last flower in this division is the most wonderful in either, but I am dubious about its right even here, for, savoring strongly of beans cooking it could hardly gratify the most ardent of its worshippers. It is a source of great wonder to me how so very beautiful a flower could have such an unpleasant peculiarity. It is like someone trying to please both good and bad, entirely succeeding in the latter but only partly succeeding in the first. But we can forgive many things to *Passiflora incarnata.*

And now for the sweets. In point of blooming time, *Nothoscordium striatum* is an example of the last being first and the first being last, for under favorable conditions (moisture and not too cold), it has been found in all seasons of the year. Very sweet when first picked, it loses its fragrance in a short time, sometimes regaining it when placed in water.

Salvia farinosa grows in abundance on the chalky prairies. Large beds of it are remarkably beautiful in the twilight, its exquisite blue seeming to glow in the half light. With more rain it would undoubtedly be a perpetual bloomer, for every little rain starts it flowering afresh. It is even more fragrant after it is picked and placed in water than before, as is also *Centaurea Americana.* The aroma from a bouquet of the sage is fresh and stimulating but that of the *Centaurea* is almost cloying.

We have three fragrant trees, *Melia azederach, Fagara clavaharculis,* and *Sophora affinis.* The heavy exotic sweetness of the china-berry on a warm spring night makes the most obtuse mortal exclaim in delight as he becomes aware of this breath from the Far East. Standing under a *Sophora,* one begins to look around for oranges, the pink and white flowers subtly recalling them. *Vitis cordifolia* climbs high in the oaks

near the streams, and in the brush not far from dwellings, *Lonicera Japonica* has established itself. Only the climbing branches bloom. Those that clasp the earth are sterile.

The scented purplish pink heads of *Schrankia angustata* smell somewhat like oil of wintergreen. It is a delicately pretty plant spreading close to the ground. *Tradescantia Virginica* often grows near it as does also that exquisite little amaryllid, *Cooperia pedunculata,* but by far the favorite home of the latter is the lawns made on the once rich prairies. After every rainy spell from July to the last of September, our lawn will be gleaming white with hundreds and hundreds of its stars whose sweetness saturates the outside air and penetrates into the house, both upstairs and down. The few leaves are unnoticed in the grass and, unless one looks closely for the buds, they too are never seen, and then comes the great surprise some morning or evening. I do not remember them blooming more than four times in a season but that was an unusually wet year. A little girl whose vocabulary had not yet acquired the word fragrance once observed to me with a half-regretful air, "I pick them because they are so sweet, but after awhile I smell all the taste out of them." But like the *Nothoscordium*, the fragrance often returns if they are put in water.

In some low grounds, *Conoclinum coelestinum* may be found blooming late in summer, but it is really only slightly fragrant and perhaps I ought not to list it. Another Composite not very strongly fragrant is *Dracopsis amplexicaulis,* which to my mind is the most beautiful of the cone-flowers. I know a piece of ground that was without one plant six years ago. The next year there were a few and each succeeding year they have increased by thousands. Where they are crowded, there is every graduation in size from six inches high with one tiny flower to three feet high with many long stems bearing columns an inch and a half high skirted with ray-flowers over an inch long.

Dracopis is unique in the list for its color. Its bright orange rays with red-brown bases are by far the most brilliant of all. The pink of the *Sophora* is only slightly tinged with purple, the pink of the *Schrankia* is a little more so, but the color range of the others is of a greenish white to purple through blue.

Croton monanthogynus, one of the most fragrant plants here, has inconspicuous greenish flowers, but the odor arising from the bruised herb as one walks over the rocky prairie where it grows profusely at midsummer is very pleasant, but I was moved to laughter when I encountered it down here for the first time, for there was revealed to me the secret of the "wonderful Indian Remedies" in generous sample pockets which the only pupil of the Great Indian Medicine Man left at the door in person every summer up north, and I could hear again the "performance at eight o'clock."

AN INTERESTING CASE OF SEASONAL INVERSION

By Walter Albion Squires.

MOST plants have a well-defined season for growth and an equally well-defined season for rest. The degree of tenacity with which our various plants cling to their own particular time of year for growth and for rest has never been systematically studied, and offers a most interesting field for original investigation. It is a fact well known to florists that certain plants stubbornly resist all efforts to force them, while other plants take quite readily to the florist's encouragement and reward him with abundant unseasonable blossoming.

Over most of our country autumn and winter is the period of rest for plants, while spring and summer is the time of

growth and flowering. In most parts of California this order is largely reversed. Winter is with us the growing period; summer is the resting period. Autumn is the time when the young green shoots appear; spring is the time of maturing fruits. That most eastern wildflowers find it hard to adjust themselves to this inverted seasonal order is painfully evident to anyone who has tried to grow them in California. They may be kept alive for a season or two, perhaps longer in certain instances, but as for adjusting themselves to our inverted California program, I have never known any able to do that. Certain weeds seem to get along fairly well, indeed, the winter-growing program they apparently find quite to their liking.

We also have a number of native plants identical with species found in the East, but these for the most part grow in localities where conditions closely approximate eastern conditions and the inverted California order does not apply. I knew of one plant, however, which apparently has adjusted itself quite perfectly to California conditions. The fragile fern (*Cystopteris fragilis*) is not uncommon with us and is found in localities which become quite arid in summer. During the dry weather its fronds crumble to powder, but the root stock remains alive and puts forth fresh fronds at the first autumnal rain. Its cycle of annual growth is almost exactly reversed from what it is in the Eastern states. In the East it begins its annual growth in April or May; with us in September or October. In the East it matures in September or October, with us in April or May. Does any reader of *The Botanist* know of any other plant in which this inversion of the seasonal program is so completely inverted?

A BOTANIST'S SUGGESTION FOR A NATIONAL FLOWER

By E. F. Andrews.

AS the patriotic sentiment of the nation, aroused by the great world crisis, is eagerly seeking new modes of expression, it may not be out of place to revive the oft mooted question of a national flower. France has her lily, England her rose, Scotland her thistle and Erin her shamrock, which typify the glory or the prowess of these States and awaken in the hearts of their people, wherever they may behold these gentle monitors, sweet memories of home and country. All of our States save ten, have likewise their appropriate floral emblems, but the United States, our common country, is still, so far as I know, without a recognized floral sponsor.

And what shall America, the home of so many beautiful and useful plants, choose as a fitting emblem of her greatness? It must be no pampered queen of the garden, nor any proud aristocrat of nature's own creation, holding itself aloof in solitary grandeur from the common walks of our every-day life. The flower I would propose for this honor is the most democratic of plants. It requires no coddling nor coaxing to induce it to grow, but makes itself at home in almost any surroundings. In shady copsewoods, in open fields and meadows, along the borders of dusty roadsides, in hedgerows and in waste places, it blooms freely and brightens the landscape with its presence, but never seeks to overrun and destroy, like the militaristic weeds that invade our fields and gardens, nor drives the native plant population from its home in the wild. It does not wear the purple robe of kings nor deck

itself in the flaming red of bloody war and the consuming torch of the invader, but wears the livery of the golden sunshine, while its brightness calls to mind no fiercer flame than the peaceful glow of the domestic hearth. And its face is always turned to the light, as the face of our country, let us hope, will always be turned toward the light of liberty, of justice, and of humanity.

It is hardly necessary, now, to say that the plant alluded to is the sunflower. The reader has probably already guessed this for himself. But while truly a sunplant in its preference for light and sunshine, it is not heliotropic in the same sense as plants like the cotton, which follow the sun in his daily course through the heavens; and I suspect that the name "sunflower" refers rather to its broad disklike face surrounded by a ring of bright rays, which is very suggestive of the symbolic representation of the sun familiar to us in old almanacs, and in common use among nearly all peoples from the remotest times. It is the most cosmopolitan of flowers, and there is hardly a corner of the globe—certainly not of the temperate zone—where some of its kindred may not be found. Forty-four species are credited to our Southern States alone (from Texas to Maryland, inclusive), and probably twice as many more might be counted in other parts of our country and Canada. In South America, some twenty species have already been described, besides those that country has in common with us. The Old World, also, could add a goodly company, to say nothing of our "big sunflower" (*Helianthus annuus*) which it has utilized in cultivation much more extensively that we have.

And if these are not enough to satisfy all tastes, there are a number of closely related species, such as the cone-flowers (*Rudbeckia*), better known by their popular name of "black-eyed Susan"—which, for the purpose here intended, may answer very well in place of sunflowers, as the lily of

France, for instance, as used in heraldry, is not a lily at all in a botanical sense, but a conventionalized representation of the iris that has no existence in nature. In choosing a flower for purely sentimental or decorative purposes, it is not necessary to be very particular as to botanical distinctions which the general public knows and cares nothing about. For this reason it would not be advisable to designate any one of our numerous species of *Helianthus* as the national emblem, but to accept whatever the popular nomenclature recognizes as a sunflower, and thus spare the average citizen the trouble of taking a lesson in botany before he can tell whether he must display a *Helianthus annuus,* or a *Helianthus microcephalus,* or any one of a score of other botanical puzzles, in order to give proper expression to his patriotic feelings.

But the strongest point in favor of the proposed choice, I have reserved to the last. If anybody will examine carefully the disk of one of these so-called flowers, he will find that it is not a single blossom, as is commonly supposed, but a whole community, or a federal union, so to speak, of small flowers which have combined into a compact association for their mutual benefit, and thus exemplify, with striking appropriateness, our national motto: *"E Pluribus Unum."* By the common consent of botanists they are regarded as represening the highest stage of progressive evolution yet attained in the plant world. And since America has assumed the proud position of a leader in the cause of democracy against despotism, what more appropriate symbol could she find than this democratic republic of flowers?

A POLLINATING CONTRAST

By Albert A. Hansen.

ONE day last spring, while tramping through the woods, I came across a most unusual sight. On the side of a stream was a skunk cabbage in full flower, while close by was a beautiful pink lady's slipper whose corolla had just unfolded, displaying its matchless beauty. It was a rare sight, indeed, to find these two harbingers of spring flowering at the same time, since the skunk cabbage forms its flowers so early that they frequently may be seen breaking through the late winter snows.

Nature being so bountiful in her flowering gifts, I decided to study something of the pollinating habits of these strangely contrasted plants. It is well known that whereas the lady's slipper blossom is truly a flower, the so-called flower of the skunk cabbage is in reality an aggregation of flowers, mounted on a central column, the whole surrounded by an outer fleshy covering, the spathe. True to its name, the skunk cabbage is an ill-smelling plant, emitting an odor similar to that of a skunk, combined with a strong suggestion of garlic, the whole reminding one of the smell of decaying meat. This deception is further carried out by the streaked reddish, flesh-like appearance of the spathe. Knowing that most flowers are dependent upon insects for the transference of their pollen, I wondered what strange types of insects could possibly be attracted to this malodorous plant, with its putrid-meat-like cloak of deception. My observations were quickly rewarded, for a scavenger beetle soon climbed awkardly along the twisted edge of the spathe,

and crawled in, while through the narrow slit which the spathe provided as an entrance could be seen many small black flies, co-operators with the beetles in their scavenger-mission in the world. So numerous are these flies that spiders take advantage of their presence to spin webs in the darker recesses of the chamber of the spathe, there to ply their nefarious practice of capturing them. Nature seems to have reached the zenith of evolutionary oddity when she created these imitators of putrid flesh as an inducement to attract the scavenger insects.

And now my attention was focused on the gorgeous blossom of the lady's slipper, a delightful contrast to that of its loathsome neighbor. The odor is fragrant and sweet, and we seem to meet the culmination of all that is lovely and beautiful in this wondrous flower. The question uppermost in my mind was: "Is it possible that this dainty blossom should be desecrated by visits from the same scavengers which call upon its foul-smelling neighbor?" I decided to investigate, and had not long to wait. With a loud buzzing of its tiny wings, a bee flew to the slit between the two main petals of the exquisite blossom and forced his burly frame inside. What takes place in such cases is well known. Within, the bee finds a spacious compartment, toward one end of which a feast of the finest nectar awaits him. After banqueting, he investigates to find the easiest way out. He cannot leave by the entrance, since the fissure has already closed behind him. Beyond the nectary, two tiny gleams of white light attract him, and he forces his way through the narrow passage to the world outside. But on the way out, he pays for his feast by having his back scraped free of pollen by means of the sticky, hairy stigma, which he is forced to touch. Just as he is about to emerge to liberty the flower exacts its final toll by plastering his back with a bountiful supply of pollen. Satisfied with his experience, the bee seeks another lady's slipper, where the pollen from the previous host is carded out by the bristly

stigma and a new load clapped upon the bee's back. Thus is cross-pollination ingeniously and effectively performed. It would be difficult to find in nature a stranger or more interesting contrast than this curious comparison between the low orders of scavenger insects attracted by the peculiar odor and appearance of the spathe of the skunk cabbage and the more intelligent insects attracted by the fragrance and exquisite beauty of the lady's slipper. The secrets and mysteries of Nature are alike curious and interesting.

HERBS WITH FLESHY FRUITS

TREES and shrubs have a variety of ways of distributing their seeds, ranging from mere capsules, from which the wind shakes the seeds, to winged fruits and seeds, explosive fruits, seeds with hard coats distributed by mammals, and juicy fruits distributed largely by birds. Hooked seeds and fruits are the only common device for distributing seeds that the woody plants lack, but it is obvious that such modifications would be useless in the tree-tops. These various methods of seed distribution are all represented among herbaceous plants, though the occurrence of juicy fruits in them is so rare as to be remarkable. This very decided restriction of such fruits to the woody plants doubtless has some bearing on evolution, if we could fathom it, but what it is nobody at present seems to know. That there are a few herbaceous species with juicy fruits is shown by the following list from the vicinity of Kutztown, Berks County, Pennsylvania, compiled by Mr. C. L. Gruber. It is important, not only for what it contains but for the vast number of fleshy fruits which are excluded because borne on woody plants. If readers can add other species to this list we shall be glad to publish them.

Asparagus (*Asparagus officinalis*), red.
False or wild spikenard (*Smilacina racemosa*), red, speckled.
Starry Solomon's seal (*Smilacina stellata*), blackish.
Two-leaved Solomon's seal (*Maianthemum Canadense*), red, speckled.
Solomon's Seal (*Polygonatum biflorum*), blue.
Solomon's seal (*Polygonatum commutatum*), blue.
Lily of the valley (*Convallaria majalis*), orange.
Indian cucumber root (*Medeola Virginiana*), purple.
Nodding wake-robin (*Trillium cernuum*), red-purple.
Carrion flower (*Smilax herbacea*), blue-black.
Upright smilax (*Smilax ecirrhata*), blackish.
Poke (*Phytolacca decandra*), dark purple.
Golden seal (*Hydrastis Canadensis*), crimson.
Blue cohosh (*Caulophyllum thalictroides*), blue.
May apple (*Podophyllum peltatum*), yellow.
Virginia strawberry (*Fragaria Virginiana*), red.
European strawberry (*Fragaria vesca*), red.
White strawberry (*Fragaria vesca alba*), white or cream.
American wood strawberry (*Fragaria Americana*), pink or light red.
American spikenard (*Aralia racemosa*), dark red or purple.
Wild sarsaparilla (*Aralia nudicaulis*), black-purple.
Bristly sarsaparilla (*Aralia hispida*), dark purple.
Ginseng (*Panax quinquefolium*), crimson.
Dwarf ginseng (*Panax trifolium*), yellow.
Apple of Peru (*Nicandra Physalodes*), bluish.
Ground-cherry (*Physalis pubescens*), yellow.
Ground-cherry (*Physalis subglabrata*), blue-purple.
Ground-cherry (*Physalis Virginiana*), reddish.
Ground-cherry (*Physalis heterophylla*), yellow.
Strawberry tomato (*Physalis Alkekengi*), yellow.
Black nightshade (*Solanum nigrum*), black.
Horse nettle (*Solanum Carolinense*), orange-yellow.
Bittersweet (*Solanum Dulcamara*), red.
Potato (*Solanum tuberosum*), green.
Tomato (*Lycopersicum esculentum*), red or yellow.
Feverwort (*Triosteum perfoliatum*), orange-red.
Narrow-leaved horse-gentian (*Triosteum angustifolium*), orange-red.

BOGS IN A BOG

SOME really remarkable objects are so familiar as to attract no especial notice. An excellent illustration of this statement is found in certain small knolls which occur in wet lands. In parts of the United States and in England such hummocks are known as bogs, though this term, by common consent, is more usually applied to the regions in which such bogs are found. Doubtless the original bog-trotter was found stepping from hummock to hummock in order to keep his feet dry when crossing the bog. At any rate, this is one of the uses of this kind of bog at present.

The exact cause of such elevations above the general level of swamp and bog does not seem to be known. Physiographers and ecologists are equally reticent concerning them. Among country people they are usually assumed to be due to the trampling of cattle, but such causes are not likely to produce the regularly rounded forms shown in our illustration. Ecologists incline to attribute the hummocks to the activities of various species of plants. Several wet ground species tend to

grow in tufts, and one *Carex stricta,* is known as the tussock sedge from this habit. That this plant is not the only tussock former is proved by its absence from many regions where tussocks are found. Moreover, examination of such tussocks or bogs show them to be composed partly of earth and their method of origin is by no means settled.

The photograph from which our illustration was made, was taken near Marengo, McHenry County, Illinois, and communicated by Miss Florence M. Arthur of Joliet.

FOOD FROM WILD PLANTS

(Concluded.)

RANUNCULACEAE.

Ranunculus ficaria. LESSER CELANDINE. Used as a potherb in Europe.

Caltha palustris. MARSH MARIGOLD. Leaves used as a potherb.

Caltha leptosepala. MARSH MARIGOLD. Used like the preceding.

MAGNOLIACEAE.

Illicium Floridanum. ANISE TREE. Fruits used for flavoring.

ANONACEAE.

Asimina triloba. PAPAW. Fruit fragrant, sweet and edible. Often called wild banana. Related to the tropical custard apples. Improvement by culture probable.

BERBERIDACEAE.

Berberis Canadensis. BARBERRY. Berries strongly acid. Used like cranberries and in jelly making. The fruit of the cultivated barberries may be used for the same purposes.

Podophyllum peltatum. MAY APPLE. Fruit edible, sweet and well flavored, suggesting the guavas. Used for

jellies and also eaten raw. Called wild lemon. Foliage poisonous as is also the root which forms an official drug.

LAURACEAE.

Sassafras variifolium. SASSAFRAS. Bark of the root used in making tea. Regarded as medicinal. Pith of the stem yields much mucilage.

Benzöin aestivale. SPICE BUSH. Fruits once used like allspice. Leaves used as a substitute for tea.

PAPAVERACEAE.

Papaver somniferum. POPPY. The seeds of this and other species used in bread and cakes.

CRUCIFERAE.

Brassica sp. MUSTARD. The mustards are valued as pot-herbs and are sometimes cultivated for this purpose. The seeds of *B. nigra* yield a bland oil and are used in preparing the well known condiment.

Nasturtium officinale. WATER CRESS. Well known as a salad plant.

Nasturtium amoracia. HORSE RADISH. The use of the roots as a condiment familiar to all. Leaves used as a pot-herb.

Barbarea vulgaris. WINTER CRESS. Plant used as a pot-herb. Called poor man's cabbage.

Barbarea verna. SCURVY GRASS. Young plants used as a winter salad.

Dentaria diphylla. CRINKLE-ROOT. Rhizomes with a peppery flavor. Edible.

Dentaria laciniata. PEPPER-ROOT. The starchy, pungent, tubers are edible.

CRASSULACEAE.

Stylophyllum edule. Young leaves used as a salad by the Indians.

SAXIFRAGACEAE.

Ribes cynosbati. GOOSEBERRY. The fruit of this and several other species of gooseberry extensively used in pies, jams and the like. Could doubtless be much improved by cultivation.

Ribes vulgare. RED CURRANT. The wild red currant is regarded as being practically identical with the species cultivated. Other currants yield edible fruits.

HAMAMELIDACEAE.

Hamamelis Virginica. WITCH HAZEL. Well known for the extract made from its bark and from its habit of flowering late in the year.

Liquidambar styraciflua. SWEET-GUM. The resinous gum which exudes when the bark is injured, used as chewing gum.

ROSACEAE.

Pyrus coronaria. WILD CRAB. Fruit used for preserving and in making jellies. Could be much improved by breeding. Some wild plants have fruits as large as small apples.

Amelanchier Canadensis. JUNE-BERRY. Fruits of this and other species used in pies and sauces. Cultivation is developing improved varieties.

Crataegus mollis. RED HAW. Fruit sometimes used for jellies. Other species are likely to be useful.

Fragaria Virginica. STRAWBERRY. All the strawberries have edible fruits. The cultivated varieties have been derived from several different species by hybridizing.

Rubus strigosus. RED RASPBERRY. Fruit highly valued. Cultivated forms are derived from this or a nearly similar European form. The dried leaves have been used as a substitute for tea.

Rubus occidentalis. BLACK RASPBERRY. Fruit well flavored and valued for jams.

Rubus chamaemorus. CLOUD-BERRY. Fruit used for sauce, etc.

Rubus parviflorus. SALMON-BERRY. Used like the preceding.

Rubus villosus. BLACKBERRY. Highly valued for jams, pies, and the like. There are a large number of forms or closely allied species of the genus *Rubus* all yielding fruit that is edible.

Rosa sp. ROSE. The hips of several species of rose are used in making jelly.

Prunus serotina. WILD BLACK CHERRY. Fruit once in demand for making "cherry bounce." Bark medicinal.

Prunus maritima. BEACH PLUM. Fruit valued for preserves and jellies. Can be improved by cultivation and forms an ideal crop for sandy areas.

Prunus pumila. SAND CHERRY. A valued fruit for sandy regions.

Prunus nigra. WILD PLUM. The fruit of this and various other species of *Prunus* are useful for preserving and the like, and for providing material from which better fruits may be bred.

LEGUMINOSAE.

Cassia marilandica. WILD SENNA. Leaves used as a substitute for the officinal senna.

Baptisia tinctoria. WILD INDIGO. Tips reported to be used like asparagus. Stem yields a bluish dye.

Apios tuberosa. GROUND-NUT. Produces numerous thick starchy tubers that are edible.

Vicia spp. and *Lathyrus* spp. It is probable that several plants belonging to these genera might be improved enough to be valuable foods if necessary.

RUTACEAE.

Ptelia trifoliata. HOP-TREE. Fruit bitter, used like hops.

ANACARDIACEAE.

Rhus Typhina. STAGHORN SUMACH. Drupes acid. Used to make a summer drink. Bark contains much tannin.

Rhus glabra. SMOOTH SUMACH. Used like the preceding.

Rhus integrifolia. LEMONADE BERRY. Drupes used for making an acid drink.

HIPPOCASTANACEAE.

Aesculus pavia. RED BUCKEYE. The bruised branches thrown in water reported to stupefy fish. Roots abounding in saponin.

ACERACEAE.

Acer saccharum. SUGAR MAPLE. Sap yields much sugar of commercial importance.

Acer rubrum. RED MAPLE. Like the preceding in producing sugar.

SAPINDACEAE.

Sapindus Drummondi. SOAPBERRY. Fruits used in place of soap.

RHAMNACEAE.

Rhamnus catharticus. BUCKTHORN. The unripe berries treated with alum gives the dye known as sap green.

Rhamnus Californicus. CASCARA SEGRADA. Official drug.

Ceanothus Americanus. JERSEY TEA. Flowers and fruits saponaceous. Leaves sometimes used as a substitute for tea.

Ceanothus divaricatus. CALIFORNIA LILAC. The fruits and flowers of this and various other western ceanothi yield saponin.

VITACEAE.

Vitis labrusca. FOX GRAPE. The parent of several of our most desirable cultivated grapes. Used for wines, jellies and as a table grape.

Vitis rotundifolia. MUSCADINE. A southern vine which is apparently the parent of the scuppernong grape. Several other wild grapes are valued for jellies and wines.

TILIACEAE.

Tilia Americana. Basswood. The inner bark yields a strong and useful fiber. In Europe this is often woven into mats.

MALVACEAE.

Abutilon Theophrasti. Indian Mallow. Stem yields a strong fiber.

PASSIFLORACEAE.

Passiflora incarnata. Maypops. Fruit the size of a hen's egg, edible, with a flavor suggesting the tropical grenadilla.

CACTACEAE.

Opuntia vulgaris. Prickly Pear. Fruits edible. Several other species of cacti have edible fruits and the stems of others may be used as forage.

THYMELEACEAE.

Dirca palustris. Leatherwood. Bark contains a strong and durable bast.

ELEAGNACEAE.

Shepherdia argentea. Buffalo Berry. Fruit edible. A dry ground species which can be improved by cultivation.

ONAGRACEAE.

Oenothera biennis. Evening Primrose. Young plants used as a salad or potherb. Roots fleshy, edible. Probably to be much improved by cultivation.

ARALIACEAE.

Aralia nudicaulis. Wild Sarsaparilla. Rootstock edible. Sometimes used in place of the official sarsaparilla.

Aralia racemosa. Wild Spikenard. Roots fleshy, edible, spicy-aromatic.

Panax quinquefolia. Ginseng. Roots edible but of slow growth. In high repute with the Chinese as a medicinal plant.

Panax trofolium. Ground-nut. Each plant produces a single small round tuber which is edible.

UMBELLIFERAE.

Osmorhiza longistylis. Sweet Cicely. Rootstock of this and *O. Claytoni* with an anisate flavor, edible. Many other species of the Umbelliferae, of European origin, are used in flavoring and several of these may be found as escapes or naturalized in America.

CORNACEAE.

Cornus amomum. Kinnikinnik. Bark used for smoking by the Indians.

Nyssa sylvatica. Black Gum. The twigs soaked in water and pounded, make fair brushes.

ERICACEAE.

Ledum Groenlandicum. Labrador Tea. Leaves steeped in water sometimes used as a substitute for tea.

Gaultheria procumbens. Wintergreen. The leaves produce the well-known wintergreen oil. Berries aromatic and edible, as are the leaves.

Gaultheria shallon. Shallon. Fruit edible.

Arctostaphyllos manzanita. Manzanita. Berries used for jelly and sauce.

Arctostaphyllos uva-ursa. Bearberry. Leaves yield a brownish dye.

Chiogenes hispidula. Creeping Snowberry. Berries and leaves aromatic and edible.

Gaylussacia frondosa. Huckleberry. The fruit of this and other species of huckleberry much used for sauces and jams.

Vaccinium corymbosum. Blueberry. The fruits of practically all the blueberries are valued for pies, jams, etc. Some forms are semi-cultivated and all could probably be much improved by breeding.

Vaccinium Vitis-Idaea. Mountain Cranberry. Used, like the other forms of *Vaccinium* with acid fruits, for making sauces and jellies.

Vaccinium macrocarpon. CRANBERRY. The fruit of this and of *V. oxycoccus* yield the cranberries of commerce. *V. macrocarpon* is cultivated in many places.

EBENACEAE.

Diospyros Virginiana. PERSIMMON. The edible fruit well known. Probably easily improved by breeding.

APOCYNACEAE.

Apocynum amdrosaemifolium. DOGBANE. This species and *A. cannabinum* (Indian hemp) yield a strong fiber.

ASCLEPIADACEAE.

Asclepias Syriaca. MILKWEED. Young shoots highly valued as a potherb. Latex yields rubber.

Asclepias tuberosa. BUTTERFLY-WEED. Officinal drug.

BORAGINACEAE.

Plagiobotrys nothofulvus. POPCORN FLOWER. Roots and stem yield a purple dye.

Symphytum officinale. COMFREY. Young shoots used as a potherb.

LABIATAE.

Stachys palustris. WOUNDWORT. Rootstock producing tuberous stolons similar to those of the allied Chinese artichoke.

Monarda fistulosa. WILD BERGANOT. The drug thymol produced from the leaves and stems.

Mentha piperita. PEPPERMINT. This species and *M. arvensis* produce menthol. A number of other species of the Labiatae produce essential oils which are used for flavoring, in perfumery, etc.

Hedeoma pulegioides. PENNYROYAL. An officinal drug.

Salvia Columbariae. CHIA. Seeds used by the Indians.

SOLANACEAE.

Solanum nigrum. BLACK NIGHTSHADE. Berries reputed to be poisonous, but harmless and well flavored when ripe.

Much like huckleberries when cooked. The reputed parent of the wonderberry.

Solanum dulcamara. BITTERSWEET. An official drug.

Physalis Virginiana. GROUND CHERRY. The fruit of this and most other species of *Physalis* edible. Could undoubtedly be much improved in cultivation.

LENTIBULARIACEAE.

Pinguicula vulgaris. BUTTERWORT. Leaves used to curdle milk.

MARTYNIACEAE.

Martynia Louisiana. UNICORN PLANT. Young fruits used for pickling.

RUBIACEAE.

Mitchella repens. PARTRIDGE BERRY. Fruit rather dry, but edible.

CAPRIFOLIACEAE.

Viburnum opulus. HIGH BUSH CRANBERRY. Fruit acid, edible, used as a substitute for the ordinary cranberry.

Viburnum alnifolium. HOBBLE BUSH. Fruits edible.

Viburnum lentago. BLACK HAW. The fruit of this and *V. prunifolium* edible and the bark valued as an officinal drug.

Sambucus Canadensis. ELDER. Fruit valued for pies and wine. Bark and blossoms medicinal.

CICHORIACEAE.

Cichorium intybus. CHICORY. Root used as a substitute for coffee. Young shoots eaten like asparagus.

Taraxicum officinale. DANDELION. Young plants used as a potherb. Root medicinal.

Lactuca scariola. PRICKLY LETTUCE. Plant used like the common garden lettuce which is supposed to be a cultivated form of the species. The dried juice is an officinal drug sometimes substituted for opium.

COMPOSITAE.

Eupatorium perfoliatum. Boneset. Officinal drug.

Solidago odorata. Sweet Goldenrod. Leaves dried and used as tea. Called mountain tea.

Silphium laciniata. Rosin-weed. From the broken stems a resinous juice oozes out which forms a natural chewing gum.

Helianthus annuus. Common Sunflower. Seeds yield much oil and form an excellent poultry food.

Helianthus tuberosus. Artichoke. Stems produce numerous large underground tubers of good flavor. Plants yield immense crops and could profitably be cultivated.

Helianthus lactiflorus. Sunflower. Produces tubers not much inferior to those of *H. tuberosus* and doubtless to be greatly improved under cultivation.

Tanacetum vulgare. Tansy. Leaves a preventive against moths and carpet beetles. Officinal drug.

Artemisia absinthinum. Wormwood. Plant used in making absinthe.

Wyethia mollis. California Compass Plant. Seeds reported to be made into flour by the Indians.

NOTE *and* COMMENT

Origin of Coal.—That coal is of vegetable origin, nobody doubts, but there still seems to be some uncertainty as to how it was formed. Until recently it has been assumed that coal was produced in vast swamps by the decay of the vegetation growing there, much as the formation of peat in bogs is going on in our own day. According to Jeffrey, however, this idea must be abandoned, a more minute study of coal having indicated that this mineral has resulted from an accumulation of vegetable material in open water transported thither by currents of wind or water. This idea of coal formation is likely to be new to many good botanists. It, however, offers a more satisfactory explanation of the origin of certain coals, such as those known to consist almost entirely of the spores and spore-cases of ancient plants.

Trees and Climate.—It is an interesting fact that tropical vegetation is typically arborescent. Only about 12% of the species in the Torrid zone are herbs. Some entire plant families, in fact, have no herbaceous species. This is true of the conifers, the birches, walnuts, willows, oaks and related plants. Even in cold regions, these families are represented, if represented at all, by woody forms. But in those families with both woody and herbaceous species, the majority of the woody forms are in the tropics and the herbaceous species nearer the poles. This is true of the *Compositae,* the nightshades (*Solanaceae*), vervains (*Verbenaceae*), morning-glories (*Convolvulaceae*) and many others. The *Leguminosae* well

illustrate this condition. It is true that there are a few woody legumes in temperate regions, but they are greatly outnumbered by the herbaceous species. In the tropics the reverse is true; herbaceous species are rare but there are an immense number of woody forms. When we turn to the past geological ages when the climate was warmer, we find the bulk of the vegetation arborescent in nature. The evidence seems conclusive, therefore, that the herbaceous type is a response to cooler conditions and is much later in origin. The death of parts above ground, or, in the case of the annuals, the death of all the plant but the seeds, seems to be an adaptation for preserving the race. Plants which could endure the annual loss of the parts above ground would of course be able to push farther into colder and less hospitable regions.

Sir Walter Raleigh's Potatoes.—The introduction of the potato into Europe is often ascribed to the efforts of Sir Walter Raleigh, but it is possible that historical writers may have been misled by mention of potato-like vegetables in the early accounts. Certainly the plant mentioned by Raleigh's servant, Thomas Herriot, in his account of Virginia was not our familiar tuber, for he says of it, "Openawk is a kind of roots of round form some of the bigness of walnuts, some far greater, which are found in moist or marsh ground, growing many together, one by another in ropes as though they were fastened with a string. Being boiled or sodden, they are very good meat." This cannot be the potato in common use for the potato does not grow in marshy ground and is not produced in "ropes." The description points unmistakably to the groundnut or wild bean (*Apios tuberosa*) and bears interesting testimony to the fact that in 1588 the Indians used the groundnut for food. It is quite possible that the extensive patches of this plant that occur on the borders of swamps and low lands were not altogether the results of the unaided distribution of the plant, but that the Indians may have had a hand in it.

The Bluet in Cultivation.—In regions were the bluet (*Houstonia coerulea*) is not abundant, admirers of the plant often endeavor to transplant clumps of it to their gardens, but are seldom, if ever, successful. The plants may continue alive during the blooming season, but thereafter soon disappear. Looking at the yellowing flower-stalks, the gardener concludes that the plant is dead and plants something in its stead, but it appears that this is a mistake and that the plant is simply preparing for another year. There is some uncertainty as to whether the plant is a true biennial, like the fringed gentian, and dies after once blooming, or whether it is a perennial which reproduces and multiplies by means of slender thread-like rootstocks. The plant is so small and so inconspicuous when out of bloom that much does not seem to be known about it, but this is certain: Soon after blooming a large number of plantlets appear at the base of the old plants either from seeds or from offsets and by autumn have formed specimens of blooming size. In spots where more vigorous vegetation may encroach upon them, the bluets soon disappear, but when protected they continue to bloom for many years.

Unstable Nomenclature.—Some of the disdain of descriptive and taxonomic effort is due to the feeling, which is not without justification, that much of the so-called systematic work is little more than the personal naming and renaming of specimens without the addition of new knowledge or the expression of new meanings; the work is therefore likely to be disregarded as irrelevant and not worth the while. The systematist has also lost sympathy with many of his peers because of the controversies over nomenclature. The impression has gone abroad that he deals only with names. The controversies in this field issue from two mistaken premises on the part of nomenclatorialists—the assumption that nomenclature can be codified into invariable law, and the practice of making rules retroactive. Varying practice in language tends in these

days toward agreement and unification, the persisting variations being mostly in minor matters. As soon, however, as any superimposed authority undertakes to enforce rigidity, rebellion is invited and the differences are likely to be organized into counter codifications. It is probably not even desirable to have regidity in binomial nomenclature for plants. The reactionary nature of the rules is their greatest fault, however, and is responsible for most of the mischief. It upsets good practice on which the literature rests even as far back as Linnaeus. Acts of legislatures, regulations of government, ordinances, entrance requirements to colleges, and other enactments become operative at a specified future date. The names of plants are vested rights to the users of them in literature, and there is no moral warrant for the changing of those names of times past merely that they may conform to a rule of the present. If the practice were in the realms of enacted law involving property, any court would declare it illegal.—*From an Article by L. H. Bailey in Science.*

An Argument for Prohibition.—Truth adds charm to a story, lifting it above the commonplace and creating an interest which is lacking in "just a story". A recent experience of the writer makes an interesting tale which has the added strength of truth. As a member of one of the experiment station staffs, the writer recently received a number of boomerang-shaped, black, seed-like bodies, with the request that these "seeds" be identified. The sender explained that he had obtained the material from a load of rye which had been sent to a local whisky distillery, and since he did not wish to see any new weeds introduced into the locality, he desired that the specimens be identified. The so-called "seeds", however, proved to be a fungus called ergot, noted because of its poisonous principle which has been known to prove fatal to man and is dangerous to animals so unfortunate as to eat infected plants. The writer immediately informed his correspondent of the dan-

gerous character of the "seeds", and the letter received in reply indicates that at least one farmer is an enthusiastic prohibitionist. To quote literally, "Personally I would say let them put the ergot in the whisky and poison it, as the dern stuff is poison anyway. May as well kill a man outright as by inches. However, the screenings are used for cattle food and it would be a pity to injure the cattle."—*Albert A. Hansen.*

The First Frost.—Killing frost has never occurred earlier than September 10, south of the extreme southwestern portion of South Dakota, extreme southern Minnesota, central Wisconsin and the interior northern portion of lower Michigan. It has never occurred earlier than October 1 south of the extreme north portions of Oklahoma and Arkansas, southern Tennessee, and the mountain districts of North Carolina and Virginia. It has never occurred earlier than October 20 to the southward of the extreme northeastern portion of Texas, northern Louisiana, the central portions of Mississippi, Alabama, Georgia, South Carolina and eastern North Carolina. The chances are even that killing frost will not occur before September 15 in most of North Dakota, Montana and the extreme northern portion of Minnesota. By the first few days in October killing frost occurs on the average of one year in two as far south as the southern portion of Nebraska, southern and eastern Iowa, southern Wisconsin, most of the interior portion of lower Michigan and throughout the greater part of New England. By October 15 it may be expected in at least half the years as far south as the central portions of Kansas, Missouri, Illinois, Indiana, throughout eastern Kentucky and the mountainous sections of the Virginias. There is one chance in two that killing frost will not occur earlier than November 1 at the latitude of central Oklahoma, central Arkansas, and the northern portions of Mississippi, Alabama, Georgia, South Carolina and eastern North Carolina. The chances are even that it will occur by November 15 a little south of the central

portions of Texas and Louisiana and well toward the southern portions of Mississippi, Alabama and Georgia. This does not mean that killing frost will occur in the localities and on the dates specified every year, but that in the long run it occurs, as indicated, in half the years.—*Florists' Review.*

Erigenia Bulbosa.—When I was a boy in northern Kentucky, *Erigenia bulbosa* was the first vernal flower. We would rake away the heaps of beach leaves in the woods on the first warm days in March and find the little umbels of white flowers already unfolded. The little tubers were very eagerly sought after by the children, who would organize regular hunting-parties and bring them in by the quart. They had a delightful nutty flavor, and were a real delicacy. Locally they were known as turkey-peas—a name that I have never heard applied to these tubers elsewhere; nor have I ever known any other region where the edible qualities of the plant were as much esteemed.—*James C. Nelson, Salem, Ore.* [Although the little plant mentioned by Prof. Nelson is common in many parts of our country it has never made much of an impression on public fancy and several of the popular flower guides do not include it. Those who know it usually call it Erigenia, though the children dub it pepper-and-salt from the appearance of its stamens and the poetically inclined botanizer mentions it as daughter of spring and harbinger of spring, these terms being rough translations of the scientific name.—*Ed.*]

Lycopsida and Pteropsida.—Students of plant evolution have reason for believing that all vascular plants may be divided into two groups which have been named the Lycopsida and Pteropsida respectively. The Lycopsida are distinguished by many small leaves and by having their sporangia on the upper side of the sporophylls or spore-bearing leaves. None of the plants belonging to this group ever produced seeds. The group was once very widely distributed, but it is now on the decline and represented by only a few living forms, such as the

club mosses and scouring rushes. The Pteropsida, on the contrary, produced large leaves with sporangia on the backs of the sporophylls. This group originated seeds and is regarded as the parent stock from which came the flowering plants and ferns. As far back as we have been able to penetrate the geological record, the two groups of plants mentioned appear to have existed, side by side, but in all cases to have been quite distinct from each other. It is popularly supposed that a great share of the plants which formed the coal were ferns, but this is probably a mistake. Most of the fern-like plants of the coal age were really seed-plants with leaves resembling the ferns.

Evolution of the Larch.—Most of our coniferous trees, or Gymnosperms, retain their leaves during the winter. So well known is this habit that the members of the group are often called evergreens in common parlance. There are, however, a number of trees that prove conspicuous exceptions to this rule, among which are the American larch (*Larix laricina*), the European larch (*Larix Europaea*), and the cypress (*Taxodium distichum*). These cast off their leaves at the end of the growing season. Whether they have always been deciduous, or whether they have gradually adopted the deciduous habit is therefore, an interesting question. Some light is thrown upon the subject, however, by the behaviour of young larch seedlings. It is well known that plants in the immature condition often run through more or less rapidly former conditions of existence. Thus the young cactus plant may produce true leaves and only later take on the usual cactus form. Larch seedlings appear to be no exception to this rule. For some years after the seeds have sprouted, the plants retain their leaves through the winter, but when older, they throw them off. It seems, therefore, that the larches were once like the other evergreen cone-bearers, and have since adopted the deciduous habit. A similar condition exists today among genera represented in both the tropics and temperate zones.

In the tropical rain forest, the species retain their leaves, but farther toward the poles, allied species are deciduous. Tropical oaks are evergreen and those of northern regions are deciduous, but even in the latter regions seedling oaks often retain their leaves through the winter. The deciduous habit is very apparently an adaptation to avoid the drying effects of the cold. Only in the drier parts of the tropics do the broad-leaved trees drop their leaves and then it is for the same reason—to avoid injury through drouth.

THYMOL.—Thymol, sometimes called thyme camphor, is distilled from the essential oils of different plants. It is stimulant and antiseptic, and is much valued in medicine for external applications. Formerly the bulk of the product came from Germany and cost about $1.00 a pound, but recent events have sent the price up until it brings eight times as much. In view of the fact that it can be distilled very easily from the essential oils of a number of plants, it is likely that its production will be taken up in other regions. Thymol, as the name indicates, was originally obtained from the oil of thyme (*Thymus vulgaris*), but the common horsemint (*Monarda punctata*) and the wild bergamot (*Monarda fistulosa*) now contribute to the supply as well as ajowan (*Carum copticum*). The monardas grow wild in great abundance in many places, and thymol could doubtless be manufactured from them at small cost. Among other plants suggested as possible sources of the raw material are the dittany (*Cunila mariana*), Basil (*Ocimum viride* and *O. gratissimum*), marjoram (*Origanum hirtum* and *O. floribunda*), and *Satureia thymbra,* a plant related to our summer savory (*S. hortensis*). In addition to its other uses, thymol has recently been found to be a specific for the hookworm.

EDITORIAL

A movement has been started by a number of botanists for the establishment of a journal of botanical abstracts, upon the theory that the flood of botanical literature is now so great that no single person can hope to see everything in his line that is published if he depends upon looking through all the publications to find it. It is estimated that more than 300,000 pages of such matter appear annually. In addition to this, most of the regular publications are reported to have on hand more matter than they can publish in a year. To remedy this latter condition, additional journals are suggested, but the critical observer is inclined to suggest that each of the publications now in existence get an editor who can really edit and trim up a lot of those long-winded articles into sizes proportional to their values. Possibly half of those 300,000 pages are wasted in proving facts that everybody is willing to grant without argument, in describing minutely methods that may be assumed were adopted, and in publishing tables and diagrams of no special significance. Think what a desert Darwin's "Origin of Species" would have been had he thought it necessary to give all the statistics and describe minutely all the experiments upon which that famous book is based. We do not mean to belittle exact and careful scientific work, or to object to detailed descriptions of important and little known processes, but we do mean to imply that too many reports of research in botanical fields are padded with matter of no consequence which might well be eliminated.

If this paragraph happens to strike the eye of the gentleman who makes note of the articles in this magazine for the index to current botanical literature, we adjure him to look carefully through the "Note and Comment" department of each issue. Already he has missed several descriptions of new forms and varieties. Just imagine how peeved some eminent scientist may become when after describing some supposedly new species of plant, he learns that some modest note in this magazine has anticipated him. The abstractor should keep clearly in mind the connection supposed to exist between valuable goods and small packages.

* * *

Those who have been keeping tabs on the botanical situation in the schools, tell us that in the past ten years the number of pupils taking botany in the high schools shows a decrease of 44%, and point out that if this rate continues much longer there will not be any botany. A survey of the way in which the subject is taught in the schools, however, inclines us to wonder how the conditions could be otherwise. Botany is not one of those subjects, like mathematics, which is considered to be absolutely essential to an education. The general public regards it as a sort of ornamental, good enough to amuse young ladies who wish to avoid a more strenuous course of study. This opinion is reflected in the support usually given the teacher of the subject. The teachers of manual training and domestic science have laboratories, often costing thousands of dollars, fitted up for their use, but the teacher of botany is rarely given a greenhouse, a botanical garden, or any other collection of growing plants. As a matter of fact, a large number of botanical courses are given without a living plant in sight. Even the specimens used in the study the teacher is expected to gather in the spare time which other teachers devote to reading, writing and the movies. Field trips disarrange the school program and incur the hostility

of the rest of the faculty, and it is little wonder that after some years of profitless agitation, even the good teacher gives up and goes back to the conventional course based on dried or pickled specimens or, even worse, teaches botany "out of a book" with the result that botany becomes a talk about plants, instead of a study of the plants themselves. The effect on the child of such a course is depressing to say the least. Normal children love the woods and fields and take delight in finding and naming the flowers, distinguishing the trees, learning how they are constructed, why they behave as they do, how to make them grow, and the like, but only an abnormal child can be much interested in trichogynes, antheridia, gametophytes, sporidia and the alternation of generations. It makes no difference if college students can be trained to sit up and take such pabulum without making faces; if the child is to be interested in botany, he must be interested by introducing him to the things in botany that he appreciates, rather than by driving him through a course that he abominates. It has long been known that high school courses in botany do not leave their students interested in the subject, but until they do, the technical botanist need not look for any considerable support from the great public which in the end pays the bills.

BOOKS AND WRITERS

If there is anything about fungi that Dr. John W. Harshberger did not put into his "Textbook of Mycology and Pathology" the reviewer has failed to discover it. Nearly 800 pages are devoted to setting forth the subject in a very thorough and painstaking manner. In the first twenty-two chapters the structure and life histories of the various groups are discussed. As the author regards them, there are more than 100 families of fungi and each of these with its important species is included. This part, alone, would make a book of fair size. The next

ten chapters deal with plant pathology and the way fungi cause disease. Then comes a section on special plant pathology in which is given a list of the principal plant diseases of the United States and Canada, alphabetically arranged by host-plants with references to the literature concerning them, followed by a detailed account of these diseases. Forty-six lessons for use in laboratory work come next, and the book concludes with a series of appendices covering the making and use of all known fungicides, keys to the groups of the higher fungi, and various other matters. Throughout the book, each chapter is followed by a very extensive list of references to the literature of the subject. The chapters themselves have a wealth of detail about individual species that is impressive. There are also 165 illustrations. The author states that the book is the outcome of twenty-seven years work with the fungi, and looking through it, we can well believe him. It is published by P. Blakiston's Son & Co., Philadelphia, at $3.00 net.

Forty years ago, DeBary issued a volume on the anatomy of vascular plants which ever since has exerted a marked influence on the trend of botanical investigations. During this time, however, much additional information on the subject has come to light, partly through experiment and partly as the result of studies with fossil plants, which has caused a change in some of our ideas regarding evolution. Thus is rendered timely a recent book by Prof. Edward Charles Jeffrey on "The Anatomy of Woody Plants." In the early chapters of this volume, the different tissues of the stem—tracheids, vessels, rays, phloem, parenchyma, fibers, etc.—are discussed and then the various organs of the plant come up for investigation, after which the trend of evolution, as indicated by the facts put in evidence is outlined. According to the author, the original tissue was woody with the primary function of conducting moisture. The other tissues of the fibro-vascular system are regarded as modifications of this tissue. In arriving at this conclusion, the

author has been greatly aided by his studies of fossil species which, owing to improvements in technique, are now almost as easily studied as sections of fresh material. Though botanists long ago abandoned the idea that the dicotyledons originated from the monocotyledons and trees from herbaceous forms, it may be worth mentioning in passing that the author finds no evidence in support of the old belief. As a matter of fact, the monocotyledons are now supposed to have arisen from the dicotyledons and herbs from trees. In some monocotyledons a second rudimentary cotyledon is frequently found. A great group of plants, the Pteropsida, which has existed from early geological times with possibly all its forms tree-like in the beginning, is assumed to have given rise to three great divisions, namely: the fern-like plants, the Gymnosperms of conifers, and the Angiosperms or true flowering plants. On anatomical and other grounds the author regards the genus *Casurina* as one of the most primitive of dicotyledons and closely related to the Betulaceae, Fagaceae and Ericaceae. This latter family (the heaths) has always held a much more advanced position in systems of classification. The book is of special interest for the large number of photo-micrographs used as illustrations. Such examples carry conviction when a mere drawing would not. There are 475 pages and 306 illustrations in the book, which is octave in size. It is published by the University of Chicago Press, at $4.00 net.

Vol. 24. No. 2 Whole Number 117

THE AMERICAN BOTANIST

MAY, 1918

35 Cents a Copy; $1.25 a Year

WILLARD N. CLUTE & CO.

JOLIET, ILLINOIS

The American Botanist

A Quarterly Journal of Economic & Ecological Botany

WILLARD N. CLUTE, EDITOR

SUBSCRIPTIONS.—The subscription price of this magazine is $1.25 a year or $2.00 for two years, payable strictly in advance. The magazine is not sent after subscriptions expire. Personal checks on small or distant banks must contain ten cents for collection fees. The magazine is issued on the 20th of February, May, August and November.

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The Bloodroot.—*Sanguinaria Canadensis.*

THE AMERICAN BOTANIST

VOL. XXIV. MAY, 1918 No. 2.

We may shut our eyes, but cannot help knowing
That skies are clear and grass is growing;
The breeze comes whispering in our ear
That dandelions are blossoming near,
That maize has sprouted, that streams are flowing.

—LOWELL.

THE BLOODROOT

BY WILLARD N. CLUTE.

THE bloodroot rarely claims our attention for more than two weeks in the year and yet it is a plant that is familiar to nearly everybody in the United States east of the Mississippi. A large part of its popularity is no doubt due to the season in which it blooms for the scarcity of flowers at the beginning of the vernal season gives an added attraction to blossoms of any kind. The scalloped gray-green leaves, however, each wrapped around its delicate flower-bud, pushing up through the litter on the forest floor, is a sight of sufficient novelty to cause us to pause in our walks to examine it, and the pure white flowers are really pleasing objects, though their span of existence is so short as to render them unfitted for bouquets. Not only do the petals fall a day or so after the flower expands, but the two sepals are even more evanescent and drop from the bud as it opens.

Bloodroot blossoms are especially fond of the sun and refuse to open at all on cool days. The leaves, however, last

through the summer, in this respect being quite unlike the leaves of many spring flowers, which disappear almost as soon as the fruiting season is over.

The common name of the bloodroot is derived from the red juice or latex which is found in all parts of the plant, but is most abundant in the thick subterranean rootstock. Practically all the poppy family, to which the bloodroot belongs, has a colored latex of some kind that in some cases is of commercial value. From the latex of the poppy are derived both opium and morphine. The bloodroot, itself, is regarded as medicinal and is a favorite ingredient in cough mixtures.

The bloodroot thrives in any good garden soil and if given the minimum of attention will take care of itself. Being a shade plant by nature, it takes readily to the north side of buildings and other shady places where many other plants refuse to grow. At flowering time, however, a certain amount of sunlight is desirable in producing the conditions to which it is accustomed in its forest home.

We are indebted to Mr. Carl Krebs of Cleveland, Ohio, for the excellent photograph from which our frontispiece was made.

WESTERN MALODOROUS PLANTS

By J. C. Nelson.

THE region of the Pacific Northwest is able to offer a few candidates for insertion in the list of plants with offensive or disagreeable odor. While the personal equation will necessarily figure somewhat largely in making up any list of this kind, there is little doubt that the normal nose will react very uniformly in the case of most of these species. My own observations have been confined for the most part to the

humid region west of the Cascades in Oregon. The plants indigenous to the desert area east of the mountains, since they are forced to adapt themselves to a more unfavorable environment, seem more inclined to add to their means of defense a repellent taste or odor.

The following list includes only indigenous plants. A number of our long list of immigrants possess ample qualifications for the "roll of honor", but, as they will be reported from other sections, there seems no reason for duplicating their names here. Taking the native species in the accepted order of families, our first undisputed candidate for honors is the skunk-cabbage (*Lysichiton kamtschatcense*), notable as the sole representative of the Araceae on the Northwest Coast. It is a larger and more showy plant than its Eastern namesake, and less actively odoriferous. Next comes the genus *Allium*, with a reputation almost classical. Some twenty-five species of the genus occur in the Northwest, most of them confined to desert and mountain regions. Here in the Willamette Valley, *A. acuminatum* and *A. cernuum* amply sustain the reputation of the genus.

Almost our only native representative of the Euphorbiaceae, *Piscaria setigera*, sometimes known as turkey-mullein, has a most unpleasant fetid smell when bruised. The plant, according to Piper, was used "by the Indians to stupefy fish by throwing quantities of it in the streams". If the odor is any guarantee, it must have been very effective.

Ribes bracteosum, the "stink-currant", is a common shrub along the rocky banks of mountain streams. Both fruit and foliage emit a powerful heavy odor that is distinctly disagreeable.

Osmaronia cerasiformis, the "Indian plum", our earliest shrub to flower in spring, possesses a very peculiar unpleasant odor, both of leaves and flowers, early in the season, which later almost wholly disappears.

Fatsia horrida, the Devil's club, an inhabitant of the dense forests of the Cascade Range, is formidable not only because of its cruel prickles but also because of its rank and unpleasant smell. It seems to belong in tropical forests rather than in the Temperate Zone.

Navarretia squarrosa, the skunk weed, fully lives up to its name. The odor is so distinctly mephitic that the tenderfoot is sure that a "wood-pussy" has gone into action somewhere in the neighborhood. One peculiarity of this plant is that it does not wait to be disturbed, but sends out its "fragrance" with delightful impartiality at all hours, especially at night and in damp weather. A friend of mine insists that the odor used to enter his college room in such volume as to wake him from his slumbers at frequent intervals. It is quite a shock to the Easterner to find that this plant belongs to a family that in the East is bland and innocent—the Polemoniaceae. Another plant of this family, *Polemonium elegans,* a high-mountain species, also possesses a very "loud" and disagreeable odor.

Two species of the genus *Trichostema*—*T. oblongum* and *T. lanceolatum,* particularly the latter, locally known as vinegar-weed—bear the palm for sheer intensity of odor. I had my first experience of this latter species after carrying a specimen around in a tin vasculum during a very hot summer morning. The odor went right on generating, and when the lid was opened, the effect was not far short of that produced by a whiff of ammonia. If one can imagine ordinary furniture polish raised to the *n*th power of intensity, he may have a faint idea of the virulence of the smell. Piper and Beattie in their Flora of the Northwest Coast say of *T. oblongum,* "odor strong but not unpleasant", and the first part of the statement is certainly true, but it would take a more sophisticated nose than mine to confirm the second!

A very similar odor is afforded by a desert shrub of the same family—*Ramona incana*. *Stachys ciliata,* common in wet thickets, has an odor less pungent, but extremely heavy and unpleasant.

The genus *Madia,* usually known as tar-weed (although this name is also applied in the West to the boraginaceous genus *Amsinckia*) amply sustains the reputation of the *Compositae* as strong-smelling plants. Two species of this genus are especially notorious, *M. glomerata* and *M. sativa*. Both are among our commonest field and road-side weeds, and have the same property as *Navarretia* of sending out their "perfume" without any encouragement, though unlike *Navarretia,* it seems to be greatly stimulated by the action of direct sunlight. One's clothing will reek of it for weeks after a walk through fields occupied by these species.

My own personal equation is perhaps shown by the fact that I do not include sage-brush in this list. The typical black sage (*Artemisia tridentata*), the most abundant and characteristic Western species, has an odor that can certainly be described as strong, but is personally not unpleasant. In fact, the tang of sage-brush in the autumn air seems a necessary element in calling forth the witchery of the desert, and adds greatly to its indescribable fascination. Just such a rude but invigorating odor seems called for in these vast spaces—hot-house perfumes would seem wholly out of place.

THE CARAMBOLA IN HAWAII

By Vaughan MacCaughey.

THE carambola (*Averrhoa carambola*) is one of the tropical fruits which were introduced into the Hawaiian Islands in very early times, following the discovery of the archipelago by Europeans. It is thoroughly established in many gardens and plantations. The fruit is sold in the island markets and is utilized in a variety of ways. The carambola is practically unknown in the continental United States, although it is widely planted in tropical regions, and grows successfully in southern Florida and southern California. It is native to the East Indies, but is now widely cultivated in southern Asia, the West Indies and other tropical countries. The genus was named by Linnaeus after Averhoés, a celebrated Arabian philosopher (1126-1198 A. D.). Carombola is the East Indian name for the species. The Hindu name is Kamrak; the British in India call it the Coromandel gooseberry.

The genus belongs to the family Oxalidaceae, which is represented in the mainland United States only by the little herbs of Oxalis and related genera. The family is wholly absent from the indigenous Hawaiian flora, and is represented only by introduced species. The Averrhoas comprise two or three arborescent species, extensively planted throughout the tropics. They are commonly referred to by botanical writers as natives of the East Indies, but there seems to be a question as to whether all the species are not really tropical American in origin, and carried to the East Indies and India by the early Portugese and Spanish traders. There is considerable evidence

to support the latter viewpoint, although the question is still unsettled.

The carambola tree is evergreen, 15 to 30 feet in height, with a dense canopy of dark-green foliage. Trees in Honolulu gardens, because of the relative dryness of the air, are often small and shrubby, but under more favorable conditions and a humid atmosphere the tree rises to 30 feet or more. The trunk is slender, with many branches. The wood is light red, hard, close-grained, and weighs about 40 pounds per cubic foot. This ranks it as a heavy wood, although not as heavy as many other tropical hardwoods (ex. teak, 50 pounds, greenheart, 72, and jarrah, 65). In India the wood is used for building and furniture; in the Hawaiian Islands the tree is not sufficiently abundant to render its wood of value; it is raised here exclusively for fruit and ornament.

The leaves are alternate, odd pinnate, without stipules, and with five to ten alternate leaflets. The leaflets are ovate-acuminate, entire, and petiolate. Like other members of this family, they possess sensitive pulvini and exhibit nyctitropic movements.

The flowers are in axillary or lateral cymes which are often panicle-like. They appear in the naked portions of the branches, and sometimes on the old wood. The flowers are minute, fragrant, and pale pink to deep purple-red in color. The calyx is red and glabrous. The corolla is campanulate, with five petals. There are ten stamens, the five outer usually minute and sterile. Each locule of the five-loculed ovary contains numerous ovules.

In the Hawaiian Islands the carambola trees flower in July and August, and fruit from November to January. In India it flowers from February to August. It fruits in three or four years from seed (by which it is easily propagated) and in Hawaii bears one crop annually. In some more tropical regions it bears two or three crops annually.

The fruit is ovate, two to five inches long, fleshy, indehiscent, and with five prominent, acutely-angled ribs. The skin is very thin, light yellow and fragrant. It is easily broken or rubbed, discolors badly, and thus makes the fruit a poor shipper. The immature flesh is fibrous and highly astringent, but upon complete maturity it becomes watery and crisp. There are two varieties of fruit: the sweet, which is eaten out of hand, and the sour, which is very acid, and is used for pickles. In India the astringent unripe fruits are used as a mordant for dyeing, and the acid juice is used to remove rust spots, etc., from clothing. An excellent drink, which might well be called carambolade, is made from the mature fruits, in much the same manner as lemonade is prepared. Its antiscorbutic properties are widely known. The seeds are minute, flat, and brown. The funicle is dilated into a fleshy, bilabiate, irregularly cut aril. The embryo is straight, with thin foliaceous cotyledons in a fleshy albumen.

In the Hawaiian Islands the Carambola is most abundant in the Honolulu region, and in certain parts of the long-settled districts of Lihue and Waimea, Kauai; Wailuku and Makawao, Maui; Kohala and Hilo, Hawaii. It grows well at the lower elevations, from 100 to 2,000 feet above sea level. Within its tropical temperature requirements, moisture is a more important control factor than elevation.

Averrhoa bilimbi Linn., the South American cucumber tree, is native to, and extensively cultivated in South America, but has not been introduced into Hawaii. It was introduced into India by the Portugese at a very early date, and has become thoroughly naturalized there. It is a large tree, twenty to sixty feet high, with smooth, green, cucumber-shaped fruits. These are commonly pickled or candied. The flowers are made into preserves. It is to be hoped that in time both the carambola and the bilimbi will become much more widely known in Hawaii and on the mainland.

A FAMOUS WOODLAND DESTROYED

ONE of the few remaining tracts of native woodland in Northern Illinois is rapidly falling before the attacks of the lumberman. This forest, which has been carefully preserved since the days of the pioneers, consists of several hundred acres of ash, maple, elm, basswood, walnut, butternut, cherry, papaw, hackberry, oak and other broadleaved trees. In the shelter of these grow immense colonies of hepaticas, spring beauties, spring cress, bloodroot, Canada ginger, Jack-in-the-pulpit, Dutchman's breeches, squirrel corn, toothwort, yellow and white adder's-tongues, phlox, collinsia, polemonium, three trilliums, including T. declinatum, bellworts, many violets, etc. In the early spring the ground is literally carpeted with flowers. It is no exaggeration to say that one cannot move about in the woods without treading on them. Our illustration will give some idea of the abundance and luxuriance of the spring flora in this region.

The uprooting of these multitudes of plants should give food for thought to those sentimental plant protectionists who

are wont to advise us to "Love the lily and leave it on its stalk." When the practical man of affairs desires to turn his forest into a cornfield, he is rarely deterred by sentimental or esthetic considerations. When this is fully realized, we shall cease to attempt the protection of the flowers along the wayside by pretty talk about their loveliness and will get busy on plans for acquiring as parks desirable bits of the landscape where the flowers can really be protected. Much, also, may be done in inducing owners of woodlands to protect the native vegetation therein until such time as the forest is needed for something else, while species threatened with extinction may be transplanted to protected areas. Nor is there any good reason why the thousands of acres along the railroads' right-of-way should not be preserved. The railroads practically without exception hire cheap laborers to mow down multitudes of lilies, phloxes, asters and other species that make a trip through the region by daylight attractive, and then hire high priced gardeners to decorate a few square feet about the stations with these very same plants. To be sure the right-of-way must be kept from being overgrown with vegetation, but why not discriminate between the decorative flowering plants and the weeds? Nobody mows down the same plants at the stations. Doubtless every colony of beautiful flowers along the railway will be preserved some day—if they are not all killed off before our plant protectionists wake up.

The plants of field and roadside cannot be adequately protected for the very good reason that in order to accomplish this, not a majority of the ramblers, but all, must be converted. So long as a single individual insists on picking the flowers, it is of no avail for the other ninety-nine to refrain. All children should be taught how to select flowers intelligently, so that those that are past their prime may be left to reproduce the species, but it is absurd to forbid picking entirely. The writer remembers with some chagrin some thousands of grass

pinks (*Calopogon*) which he protected from a botanizing excursion only to see the entire collection pass by, a little later in the day, in the clutches of several small boys. One should discourage large bouquets of any kind, as well as bouquets indiscriminately gathered, but flower lovers might as well enjoy the beauty of the flowers as let the cows get them or the farmer plow them under.

In many parts of our country there are large areas that, due either to their location or surface configuration, will offer safe sanctuary to the wild plants for years to come, but in the prairie States where good corn land has already advanced in price to more than $200 an acre, and where the farmers are beginning to regard with covetous eyes even the roadsides and the unused land along the railroads, the native flora is doomed to early extinction unless something besides sentiment interferes in their behalf.

A NEW KOCHIA

By J. M. Bates.

On September 9, 1915, I had a spare hour before taking train to Cheyenne, and wandered into the east suburbs of Denver for a chance shot at the flora, as it was my first visit to Colorado. I there picked up a *Kochia*, which has remained undesignated in my chronological note book as No. 3640. I had previously made but one collection of *Kochia scoparia*, an escape from gardens, and saw that this was too different to be called that species. In October I collected the same thing at Naponee, Franklin County, Nebraska, and held it also in suspense as No. 3687. Since then I have made several collections of *K. scoparia* hoping for more light.

On October 2, 1917, I found the same plant again in abundance in vacant lots and by neglected walks in Hastings, Nebraska, (No. 6607) not far from the Burlington Road,—that is, within three blocks. The Naponee collection, made on the railroad banks, is the best developed, having membranous calyx wings 2 mm. long without a trace of angularity or thickening. I therefore name the plant

KOCHIA ALATA N. SP.

The species may be described thus: Annual, spreading, not at all upright as is *K. scoparia,* obscurely pyramidal, stouter; stem puberulent; leaves much as in scoparia, strigose-pubescent on the underside, not pilose with long hairs on the margin as in my specimens of scoparia; inflorescence dense, giving a heavy appearance, branches with inflorescence sometimes longer than the plant is high, not at all reduced at maturity of seed, lightly to densely lanate with white or brownish hairs. Calyx developed into membranous wings 1 to 2 mm. long, dirty white, heavily veined, more or less erose-dentate, obovate, distinct.

If the habit of this plant was like that of *K. scoparia,* I would not think of calling it a new species. I have taken the Hastings plant as the type because it is established there beyond doubt and is easy of access. I shall study it further this season. Specimens have been deposited in the University of Nebraska, University of Wyoming, in New York Botanical Garden, and will be sent to Washington at once. The name, however, has not been attached to the plant until the present.

HERBS WITH JUICY FRUITS

BELOW are given the names of 12 herbaceous plants with fleshy fruits, which may be added to the list given in the February number of the Botanist. Notice the prevalence of red. This is probably due to "natural selection", red being more conspicuous and hence more likely to attract the attention of birds than the other colors named.—*E. F. Andrews, Rome, Georgia.*

Jack-in-the-pulpit (*Arisaema triphyllum*), bright red.
Dragon root (*Arisaema dracontium*), bright red.
Red baneberry (*Actaea rubra*), red.
White baneberry (*Actaea alba*), white.
Umbrella leaf (*Diphylleia cymosa*), blue.
Indian strawberry (*Duchesnea Indica*), bright red.
Maypop (*Passiflora incarnata*), greenish yellow.
Maypop (*Passiflora lutea*), dark purple.
Egg plant (*Solanum Melogena*), dark purple.
Watermelon (*Citrullus vulgaris*), green.
Cucumber (*Cucumis sativus*), yellow.
Gherkin (*Cucumis Angeria*), yellow.

The following list of herbs with juicy fruits has been contributed by Mrs. M. E. Soth, Blackfoot, Idaho.

Queencup (*Clintonia uniflora*), blue-black.
Twisted stalk (*Streptopus amplexifolius*), red.
Twisted stalk (*Disporum trachycarpum*), red.
False Solomon's seal (*Smilicina amplexicaulis*), reddish.
Strawberry blite (*Chenopodium blitum*), red.

Ground cherry (*Physalis*). All the species of Physalis have fleshy fruits notably *ixocarpa, Philadelphica, longifolia, lanceolata, pumila, rotundata,* and *Fendleri.*

Japanese umbrella (*Qunicula lobata*), greenish.

Ground saracha (*Chamaesaracha coronopus*), green.

Wild potato (*Solanum Jamesii*), green.

Wild tomato (*Solanum elaeagnifolium*), black.

Wild pumpkin (*Cucurbita foetidissima*), yellow.

Musk root (*Adoxa moschatellina*), green.

MAPLE SUGAR

WHILE there are a number of species of maple tree whose sap is rich in saccharine material, the production of maple syrup and sugar has been confined almost exclusively to the sugar maple tree (*Acer saccharum*), also known as the rock or hard maple. The early settlers either boxed the tree or cut large slanting slashes from the lower end of which rudely fashioned spouts conducted the sap to a bucket. This method was very destructive to the trees and boring was substituted for it.

The trees should not be tapped until they are about 30 years old, as they will then withstand boring much better. The trunks are tapped on the south or south-east side along which sap first rises in spring. It is said that the largest flow can be obtained on the side bearing the most branches or over the largest root. The richest sap is found nearest the bark, the shallow borings supplying the whitest sugar. The first tapping is made breast high and each year the hole is made lower down, although this rule is not necessarily adhered to.

The hole made is about three-eighths of an inch across. It slants slightly upward and a metallic spout is driven into it to which a bucket is attached. The old style was to have a

wooden spout with a nail driven in the tree beneath it to hold the bucket, but the nail will rust and contaminate the sap. The holes are usually not more than two inches in depth as the sap rises inside the bark through the outer ducts. If not more than one or two shallow holes are made each year the trees do not seem to be seriously damaged. Prof. C. S. Sargent mentions in his "Sylva of North America" a tree which was known to have yielded sugar every year for a century.

The season for maple sugar gathering varies with the weather. It starts when the sap commences to run in spring, and, while the season in the "sugar bush" lasts about four weeks, there are usually only from ten to fourteen good sap days. The best weather is when the temperature falls to about fifteen degrees at night and rises to fifty during the day. Bright, warm, still days and frosty nights induce the largest flow of sap.

Trees differ greatly in the amount of sap produced. In favorable weather an average tree will yield two to three gallons in twenty-four hours and during a good season give about twenty-five gallons of sap. It is stated that trees standing on high ground, on uneven rocky land or on hillsides are the best producers. The sap from different trees varies in quality and quantity and contains on the average 3% of sugar. Four gallons of sap are required to produce a pound of sugar and thirty-five gallons of sap to make a gallon of syrup.

In large camps the old method of bringing in the sap in buckets, evaporating the surplus water in a large kettle hung over a wood fire in the open, has been greatly improved. Metal pails with covers are now made which are hung on metallic spouts. A sleigh on which is a large tub lined with white metal goes from tree to tree and the buckets are emptied and replaced. At the sugar house there is a large tank with a strainer into which the sap is dumped. The evaporator pans in which the sap is now placed are six inches deep, thirty to

forty inches wide, and eight to eighteen feet long. Flues underneath lead from the firebox to the chimney. At intervals of from eight to twelve inches, partitions are placed in the pans and open at alternate ends. The sap running in from the tank flows backward and forward across the tank around the ends of the partitions until it reaches the outlet at the finishing end where it is reduced to the required density.—*From an article in Forest Leaves.*

ADDITIONAL USEFUL WILD PLANTS

RIBES AUREUM, of the older books, now *Ribes odoratum*, is extremely useful in Nebraska for jellies and sauces.

Prunus melanocarpa, a first cousin of the choke-cherry of the East, is good raw and cooked any way when quite ripe.

Prunus Besseyi, the western substitute for *P. pumila*, is large and juicy, especially when sheltered by blowing sand so that it ripens under cover.

Lathyrus ornatus is used, pod and all, like green peas.

Astragalus crassicarpus, ground plum, has been used when very young by explorers like Lewis and Clark to keep off scurvy.

Lycopus communis and allied species are made into tea to break up a cold in the absence of a physician. It contains a stimulant much like quinine.

Asclepias speciosa, exactly like *A. syriaca*, is the best of all wild greens when used young enough, that is like asparagus sprouts. As long as the stem will snap when bent it is good, young leaves and all. But beware of its imitation, *Apocynum*. In their early stages they look much alike.—*J. M. Bates, Red Cloud, Nebraska.*

In your list of food-producing plants, I believe every Westerner would want to see the name of *Lomatium cous* locally known as "biscuit-root", at one time extensively collected by the Indians as a winter food. *L. farinosum* and *circumdatum* were probably often used along with the above, as their tubers have the same agreeable nutty flavor.

The roots of *Carum Gairdneri* are said by Piper (Flora of Wash. 426) to "have a sweet nutty flavor and were formerly much used for food by the Indians", though I have not personally confirmed this.

The use of *Aesculus Pavia* for stupefying fish suggests that the Western Indians made extensive use of *Eremocarpus setigerus* in the same way, pounding it when fresh and throwing it in the streams. This would give the family Euphorbiaceae a representative in your list.—*James C. Nelson, Salem, Oregon.*

NEW SPECIES STILL ABOUND

MUCH of the earth has yet to be explored for the forms of life. There are fertile regions yet untouched. One collection in Papua yielded some 1,100 new orchids. Remarkable collections of novelties continue to come to herbaria, many of them from regions not very remote. Not nearly all the plants of the globe are known. The systematist must continually be better trained, for he has the task of understanding the older accumulations as well as adjudging the new. He makes increasing contributions to plant geography and distribution and gives us an enlarged judgment on the character of the countries of the earth as indicated by their vegetation. In fact, we never understand a country before we know its plant life.

Yet it is in the old regions as well as the new that novelties still come to the hand of the systematist. Every edition of the

manuals of the plants of the northeastern United States, for example, contains large additions: These acquisitions are in some part the result of new introductions, running wild; in an important part, the discovery of species hitherto overlooked; in large part, also, the results of redefinition, known as the "splitting" of species.

This splitting is not alone the result of a desire to "make new species," but is the operation of a new psychology. In everything we are rapidly becoming particularists. In the time of Gray we studied plants as aggregates, trying to make them match something else; now we study them as segregates, trying to make them differ from everything else. This diversity in process accounts for the extension of *Oenothera, Carex, Rubus, Malus* and *Crataegus*. Whatever may be said of the relative ranks of the newly described species, we should thereby nevertheless understand the forms better than heretofore and refine both our discrimination and our definition. Probably we do not yet really understand any one of the more representative genera of plants of the northeastern United States.

In making these remarks I am not commending the practice of those who would divide and redivide minutely and who would carry descriptive botany to such a point of refinement that only the close specialists can know the forms. Under such circumstances, systematic work defeats its own ends.—*From an Article by L. H. Bailey in Science.*

A WOODEN FLOWER

ALTHOUGH the subject of our illustration has a superficial resemblance to a flower, it is likely that everybody is aware that such a thing as a real wooden flower does not exist. This fact, however, has not prevented the newspaper scientist from spinning most horrendous yarns about it. It is reported to grow "in crevasses on the side of Mt.

Agua and around the edges of the huge volcano of Fuego in Guatamala." On this account it is sometimes known as the "rose of hell", but from such information as we can gather, we infer that a wooden flower would be quite evanescent in the region for which it was named.

Some years ago, the *Ladies Home Journal* had an account of this form from which we quote as follows: "This unique blossom is rough but beautiful and odd and wonderful in many respects. It is composed of four distinct petals, concave in form and arranged like the petals of a half-blown rose. The outside of these petals or divisions is covered with thick bark like an ordinary tree. Inside the hard surface is indented with lines that follow each other in the most delicate tracery like the veins in the petals of some flowers. The flower measures about twelve inches across and is borne in a light strong stem of solid wood about a foot long, covered with heavy bark. Stem and flower are dark brown in color and grow on trees of large size."

As a matter of fact, the specimen is a gall similar to the galls so common on our oaks and other plants and like them due to the attacks of either insects or fungi. It appears to be fairly common in Guatamala, and according to a correspondent, may be purchased for a few cents in the streets of Guatamala City. The specimens are brought in by the Indians from the mountainous country not far distant. There is a picture of the wooden flower in Engler & Prantl's "Naturlische Pflanzenfamilien" (III. 1. p. 161, fig. 10713). According to Engler the "wooden rose" is caused neither by insect nor fungus but is due to another parasite, belonging to the mistletoes (*Phoradendron*). The illustration herewith was originally published in *The Guide to Nature* and was kindly loaned by that publication for reproduction here. If any of our readers can add anything further to this account, we shall be glad to publish it.

OILS, RESINS AND RUBBERS

IN these days of shortage in nearly everything that civilized man regards as essential, a list of the principal oils, resins and gums of the world should be of interest. In the Kew Bulletin for 1917, Nos. 7 and 8, such a list is given and this, with various additions, is published here. The oils of the world divide naturally into the fatty or fixed oils, which are heavy and slow to dry, and the essential oils which are aromatic and volatile. The fixed oils are mostly derived from the seeds or fruits of various species, but the essential oils are more often derived from the leaves, stems and flowers. The fixed oils have a multitude of uses. They form the basis of much of the soap, lubricants and candles manufactured, are used extensively in painting, are often a source of food, or valued as fuel, or employed in various arts. The chief uses of the essential oils are found in perfumery and medicine. Fixed oils come largely from species inhabiting the warmer parts of the earth; the essential oils are found in species that inhabit temperate regions. The gums, resins and rubbers are peculiar in being derived principally from a sort of milky juice or latex found in certain plants and regarded by many botanists as being in the nature of an excretion or waste product.

FATTY OR FIXED OILS.

Cocos nucifera. COCONUT OIL. Obtained from the seeds. The dried meat containing the oil is known as copra. Oil used in cooking, etc. Tropical.

Elacis Guineensis. AFRICAN PALM OIL. Obtained from the seeds. Western Africa.

Attalea Cohune. AMERICAN PALM OIL. Obtained from the seeds. Honduras.

Olea Europea. OLIVE OIL. Obtained from the fruits. Used in cooking and in the arts. Southern Europe.

Ricinus communis. CASTOR OIL. Oil pressed from the seeds. Used in medicine and for burning, lubricating, etc. India, Italy, United States.

Linum usatitissimum. LINSEED OIL. Obtained from the seeds. Used in painting, etc. Widely distributed in the cooler parts of the world.

Glycine hispida. SOY BEAN OIL. Obtained from the seeds. The oil is used in soap making. China, Japan.

Zea Mays. CORN OIL. From the seeds. Used in cooking and in the arts. United States.

Theobroma cacao. COCA BUTTER. From the seeds. Used in the arts. Tropics.

Gossypium spp. COTTON SEED OIL. Oil obtained from the seeds. Used in cooking and in the arts. Warmer parts of both Hemispheres.

Brassica napus. RAPE SEED OIL. Oil extracted from the seeds. Used in the arts. Japan, China and Central Europe.

Arachis hypogaea. PEANUT OIL. Extracted from the seeds. Used in cooking, butter making and in the arts. Tropics.

Sesamum Indicum. SESAMUM OIL, GINGELLY OIL, SIM SIM OIL. Obtained from the seeds. Used as a substitute for olive oil and in soap making. India, Asia Minor, Abyssinia, Sudan.

Helianthus annuus. SUNFLOWER SEED OIL. The seed is nearly half oil. Used in the arts. China, India, Russia and British East Africa.

Balanites Maughamii. MANDURO OIL. Nut contains nearly 60% of oil. Used for burning and soap making. Portugese, East Africa.

Balanites Aegyptiaca. BETU OIL. Extracted from the kernels. Resembles cotton seed oil. Used for soap making. Nigeria, Sudan, and Uganda.

Moquilea sp. OITICIA SEED OIL. Seeds contain 64% of oil. South America.

Trichilia emetica. MAFURA OIL. Seeds contain 60% of oil. Used in cooking, soap making and for candles. East Africa.

Guizotia Abyssinica. NIGER SEED OIL, INGA OR RAMTIL SEED OIL. Extracted from the seeds. Used in soap making, as a condiment, as a substitute for linseed oil, and for burning. Tropical Africa.

Pentadesmia butyracea. OKOTO NUT OIL, KOMA NUT OIL. The kernels contain an edible oil. West Africa.

Aleurites spp. CHINESE WOOD OIL, TUNG OIL. Extracted from the wood. Used in paints and varnishes. China.

Buytrospermum Parkii. EMI OIL, SHEA BUTTER. Oil from the seeds. Used for soaps and candle making, and as a food. West Africa.

Calophyllum inophyllum. DILO SEED OIL. India.

Papaver somniferum. POPPY SEED OIL. Used in painting and in the arts. Asia Minor, Persia, India.

Camellia Thea. TEA SEED OIL. India.

Argania siderozylon. ARGAN OIL. India.

Vigna Sinensis. COW PEA OIL. China.

(To be Continued.)

NOTE *and* COMMENT

Systematic Botany.—The older systematic zoology and systematic botany fell into disrepute with the competition of the exacter studies in morphology and physiology, and they have been overshadowed by the interest centering in evolution and its derivative subjects. On the botanical side the naming of specimens as an exercise in education in schools and the making of a so-called herbarium of snips of plants have still further discredited whatever seems to be related to systematic work. So far as one can determine, this school herbarium work did not make botanists on the one hand nor lead to an appreciation of nature on the other, and it would be difficult to trace contributions to science from its suggestions. As an educational method it was faulty because it did not connect plants with either function or environment nor call for continued application on the part of the pupil.—*L. H. Bailey in Science.*

Dandelion Flowers.—Dandelions dot the green sward with buttons of gold every month of the year, except in snow time; but they really belong to spring—when the bright heads come in multitudes, opening during the sunny morning hours. Each head is at the summit of a smooth, hollow stem. Around its base are many little, green scales, which turn down when the head opens, except the inner circle which remains erect when the head is closed and spreads when it opens. Within this green cup scores of florets are crowded; each floret having a calyx, a simple yellow corolla, five stamens and one pistil, is a lovely but plain little flower, perched in the midst of a circle of white, silken threads. When the flowers fade, the inner

circle of scales closes over them, the beak on each ovary elongates and raises the dainty sail. Presently, the scales are all reflexed, the sails spread and the yellow head has become an airy, white globe. The wind blows and carries the tiny parachutes, each with a precious burden, to some spot, perhaps, where the seed can develop into a new plant. We wonder at the care of Nature in arranging details, when the small depressions, seed scars in alternate rows, are noticed on the base of the receptacle.—*Miss Nell McMurray, Clearfield, Pa.*

Fragrant Wildflowers.—Additional species of fragrant wildflowers which have come to light since the original list was published are sand verbena (*Abronia umbellata*), Western goldenrod (*Solidago occidentalis*), large-flowered datura (*Datura meteolides*), Brickellia (*Brickellia Californica*), Smooth sumach (*Rhus glabra*), yellow violet (*Viola pedunculata*), virgin's bower (*Clematis ligusticifolia*), yerba santa (*Eriodictyon Californica*), nothoscordoum (*Nothoscordum striatum*), *Salvia farinosa, Centaurea Americana* and *Prunus subcordata.* In some lists *Dodecatheon meadia* appears, but this species is certainly not fragrant in some parts of its range. Is it really fragrant or has some other species been mistaken for it?

Ill-Scented Flowers.—It is apparent that in the discussion of the odors of flowers "*De gustibus non est disputandum.*" What one observer reports as an agreeable perfume, another considers a vile odor. It is possible, however, that in some cases we may be dealing with differences in definitions. The only *flowers* that should be considered ill-scented, are those in which the flower itself is disagreeably scented. There is a long list of plants with ill-scented *foliage* which are often confused with the ill-scented flowers. The plants that bear truly ill-scented flowers appear to be rather rare. Our list at present contains only the carrion flower (*Smilax herbacea*), black snake-root (*Cimicifuga racemosa*), baneberry (*Actaea alba*), red trillium (*Trillium erectum*), Skunk's cabbage (*Symplo-*

carpus foetidus), pear (*Pyrus communis*), choke cherry (*Prunus Virginiana*), dockmackie (*Viburnum acerifolium*), arrow-wood (*Viburnum dentatum*) and corn chamomile (*Anthemis arvensis*). Other species have been reported, but in such cases it is not apparent whether it is the flower or the herbage that is ill-scented. The blossoms of the papaw (*Asimina triloba*) should be included in the list of odorous flowers, but whether among those that are sweet-scented or ill-scented seems a question. The flowers have a strong yeasty smell, not particularly agreeable but not exactly repellant. If correspondents will send in separate lists of ill-scented flowers and plants with ill-scented foliage, we will later publish more complete lists of both.

New Species in Our Gardens.—No plants go unchallenged so completely as those of widespread, common, and ancient cultivation. The treatment of them is particularly traditional. There may be no "types" representing them in herbaria. Origins may be repeated, perhaps even from the days of the herbalists. Statements are passed on from book to book and generation to generation. The plants are taken for granted. Yet when we come to study them critically, we find that they may contain new species which have passed all this time unrecognized. Any field that has long been neglected is sure to yield new harvests. The cultivated plants now provide some of the best botanizing grounds.—*L. H. Bailey in Science.*

Quadrilliums.—*Trillium grandiflorum* is a very local plant in the Lake George flora and I know of only two or three places where it is at all abundant, but in these places it is a fine sight in May when it flowers. Among the hundreds of plants I am usually able to find three or four four-parted wake-robins. I have note of finding such plants as early as 1893. Several times I have transplanted one or two of the plants, but they either do not come true next season or they fail to appear. I

have never seen a four-parted *Trillium erectum, T. undulatum* or *T. cernuum*. The latter species is rare here but *T. undulatum* is found in upland woods and about mountain ponds.—*Stewart H. Burnham, Hudson Falls, N. Y.*

Effects of Pollination.—The flower exists for the purpose of producing eggs and sperms and for facilitating the union of these bodies. The beauty and fragrance so attractive to us are merely incidental. The first of the processes with which the flower is concerned is pollination. With the phenomena attending this we are all more or less familiar, but many fail to realize the extent of the changes which result from the depositing of the pollen on the stigma of the waiting flower. When this occurs, the pollen tube begins to grow down through the carpel until it reaches the ovule where its contents, fusing with the contents of the ovule, fertilizes the egg, causing the embryo plant to develop. The stimulus of this act usually reaches much farther for the ovary begins to swell to form the new fruit and not infrequently the receptacle enlarges as well, as in the case of the apple and strawberry, where this becomes part of the fruit. Plants, however, vary considerably as to the extent to which pollination or fertilization affects these processes. Every season uncounted millions of flowers open but, failing to be properly pollinated, are cut off by the parent plant and fall to ground unnoticed. There are, to be sure, some plants, such as the navel orange, which may produce fruits without pollination, but this is unusual. There are other plants in which pollination alone is sufficient to cause fruits to develop, though of course without seeds, but in the great majority, fertilization is necessary, and in a few, such as the pumpkin and its allies, the stimulus of the growing seeds is necessary to continue the development of the fruit. This explains the failure of many pumpkins to go on to maturity after enlarging to possibly half the natural size. In the apple, the flavor appears to be largely dependent upon the

formation of seeds. Nobody at present pretends to say how such changes are effected, but it is probably due to some enzyme that, originating in one part of the plant, produces effects in another.

Anemone Nomenclature.—One might infer from Mrs. Soth's very interesting article that the Western "pasque flower" (which is commonly called "crocus" in northwestern Iowa) is typical *Anemone patens* L. Is not the Western plant to be referred to the var. *Wolfgangiana* (Bess.) Koch? I am not enough of a classical scholar to be sure about this, but did the "Anemone" fabled by the poets to have sprung from the blood of Adonis really belong to that genus? Linnaeus, following Dillenius, established the genus *Adonis* in commemoration of the fable, and evidently considered *A. autumnalis,* the "cornadonis" or "pheasant's eye", with its bright scarlet petals, to be emblematical of the blood of the ill-fated youth. Surely none of our American species of *Anemone* are so brilliantly colored as to suggest the legend.—*J. C. Nelson, Salem, Oregon.* [As to the scientific name of the pasque flower, Prof. Nelson is technically right, but those who are disinclined to give either support or comfort to the name-tinkers find an opportunity here to treat their labors with contempt, for while some authorities use *Wolfgangiana,* Britton and Brown do not, though the latter admit that the European *Anemone patens* has the lobes of the leaves somewhat broader than in the American plant. The decision hinges on whether this characteristic is sufficient to make a variety and allow us to christen it with a name that is suspiciously germanesque. The differences of opinion regarding this plant do not stop here. Not only is there a question as to whether it is the anemone of the poets, but there is no agreement as to the origin of the generic name or the pronunciation of the common one. Almost anybody will say offhand that *Anemone* comes from the Greek *anemos,* the wind, thus in-

cidentally accounting for the name windflower, but the latest edition of Gray says the world is corrupt Greek and Latin for *Na man* the Semitic name for Adonis "from whose blood the crimson-flowered Anemone of the Orient is said to have sprung." However, Adonis, at his death, is supposed to have been changed by Venus into the flower now known as *Adonis autumnalis.* Not a few New Englanders spell the common name *anemony* and even some eminent botanists pronounce it as if spelled Annie Mony. It may be added that if *Anemone* is derived from the Greek *anemos*, it should be accented on the third syllable.—Ed.]

Potato Blossoms.—Apropos of the notes on potato fruits and blossoms in November *Botanist,* I observed as a lad in Connecticut that the old variety, called meshannock or mercer, which we continued to raise for several years after the community had taken up the Jersey peachblow as a substitute, gave fewer blossoms as the years passed by and very few of those produced seed-balls. I have always understood that any plant that is continuously reproduced from bulbs, cuttings, or other forms than seeds, gradually ceases to produce seeds. L. H. Bailey, in "Cyclopedia of Horticulture", article "potato", makes the same observation. All new seedling varieties of potatoes that I have had opportunity to observe seed, bloom, and fruit profusely. I observe that Baldwin apples have very few seeds compared with the newer varieties. If I were living where I was using the oldest varieties, Rhode Island Greening and the like, I should expect to find similar results. I am sure that oranges and bulbs like tulips, show the same tendency. How often does one see tulips fruiting under favorable circumstances? I hope we shall hear more of this matter.—*James M. Bates, Red Cloud, Nebr.* [The question whether varieties multiplied vegetatively tend to run out is one that is by no means settled. The growers of gladi-

oli have the impression that the large corms which form above the old ones, gradually cease to produce good flowers, while the cormels which are ordinarily produced in numbers at the base of the old corms are supposed to possess greater vigor. On the other hand, we may point out that the date palm has been propagated from vegetative shoots for thousands of years, and shows no deterioration in seed production. It is very likely that plants which store an abundance of food in underground parts have little left with which to produce flowers and fruits, and this characteristic may well be a part of the make-up of a given species or variety. But this field is practically untouched as yet. As to the seeds in apples, recent studies seem to indicate, that the number depends on the crossing of the flower with pollen from some congenial variety. There are so many complications of weather, pollination, season, soil, fertilizers and plant constitution connected with this question that it may be a long time before it is settled. Observations such as those of Mr. Bates, therefore are of much interest.—Ed.]

Molecular Structure in plants.—A French scientist named Pictet suggests that the difference between the living and non-living parts of plants may be merely the difference in the architecture of the molecules composing them. Molecules, as everybody knows, are composed of atoms and according to our author there are only two fundamental plans in which the atoms are arranged in them. In one, there is a sort of linear, or chain-like arrangement; in the other, the atoms form a ring or closed chain. To these forms, which serve as axes, other atoms may be attached. These systems of arrangement however, are not equally stable. It is comparatively easy for the chemist to cause a chain of atoms to assume the cyclic form, but it is much more difficult to break up the rings thus formed. The interesting fact in this connection is that the materials which plants use as foods—

sugars, starches, acids, fats, glycerins and various others—have molecules with the atoms in chains, while those which may be regarded as waste products or products concerned with the metabolism of the plant—such as turpentines, camphors, pigments, resins, rubbers, tannins, glucosides, and alkaloids—have molecules of the cyclic type. It is assumed that this latter group of substances has been derived from the first group by the changing of their molecules from open chains to rings by the plants. Furthermore, the substances in the first group can pass freely into the cells, but those with cyclic molecules find it difficult or impossible to do so. This conception of the form of the molecule may help to an understanding of the differences between starch and cellulose. These two substances have the same chemical formula and yet it is usually easy to distinguish between sawdust and breakfast food, however much the former is camouflaged. The essential difference, according to Pictet, is that the molecules of starch are in chains while those of cellulose are cyclic. The constituents of coal tar all have cyclic molecules and it is from such substances that an immense number of dyes, drugs, and other useful substances are manufactured. Protoplasm, itself, is supposed to begin with molecules in chains and to end by stabilization with its molecules of the cyclic type.

EDITORIAL

In this issue will be found notes on practically every subject previously taken up by the Botanical Observation Club. We mention the matter here in order to call attention again to the fact that in addition to the articles of general interest published, we are conducting various lines of original investigation in which all who care to do so may help. Often the individual contribution may be only a note, but a note, nevertheless, without which the summary would be incomplete. We trust that our readers will occasionally glance through past numbers of the magazine and when they can add anything to the observations previously made, that they will do so. We do not consider any of the lines of investigation closed, and shall welcome further notes on fragrant wild-flowers, wild food plants, herbs with berries, and other subjects which have been up for discussion. There are neither dues nor fees in the Botanical Observation Club. Sending in notes makes you a member.

* * *

Word has gone out that in order to save the wheat crop from destruction all barberry plants must be exterminated. The reason for this order is that the wheat rust, a fungus that often causes much damage to the growing wheat, passes one stage of its life cycle on the leaves of the barberry. A significant fact in this connection, however, is that the wheat rust does not have to grow on the barberry. If none of these

plants are about, it sets up its infection directly upon the wheat plant. The barberry, therefore, comes in as a possible harborer of the rust only, not as an essential factor in its distribution. The destruction of all barberry bushes would not eradicate the wheat rust. In view of this fact, one wonders why all this hostility to the barberry. If the shrub happens to grow close to the wheat-fields, the rust may be found upon its leaves, but elsewhere it is so rare that many good botanists and most farmers have never seen it. Surely to insist upon the destruction of the barberry in our parks and large private grounds is carrying the matter too far. Incidentally this reminds us that the nurserymen have raised a large sum for the purpose of inducing the public to plant more shrubbery. It is likely that they do not feel bad at the barberry's plight. At any rate the war is on and the barberry will have to capitulate. Fortunately the Japanese barberry so extensively used in hedges and other plantings does not harbor the wheat rust. *Berberis Canadensis* and *B. vulgaris* are regarded as the sole offenders. People invited to pull up their barberry bushes should make sure that the plants are the suspected species before rooting them out.

* * *

The question whether or not, in the absence of better food plants, man could have originated forms just as good from the wild plants in the cooler parts of North America has never been decided; but the fact is, he has not done so. The tomato, potato, maize, bean and various other vegetables are of American origin, but they are all natives of the tropics and their appearance in more temperate regions is due to man's intervention. American food plants, however, appear not to have received half the attention they deserve. Of the cultivated plants, maize has been somewhat more extensively differentiated than some of the others, for we now have sweet corn and pop corn, as well as the ordinary field corn, and the breeders

are talking of varieties of the latter with high or low starch and oil content, but up to the present, the growers have been so much interested in the size of their crops that they have given little thought to the quality of their product. Those who have much to do with corn bread, mush and Johnny-cake, know, and those who may be obliged to use these high-priced substitutes for wheat will discover, that there is a great deal of difference in the flavor of various varieties of corn. Meal made from the white varieties has a much more delicate flavor than meal made from the others. Some forms of the white meal when properly cooked can scarcely be distinguished from similar foods made from wheat. When differences of this kind exist without the assistance of the plant breeder it is apparant that intelligent direction would still further improve the quality. Without question, forms could be produced which would yield a flour scarcely to be distinguished from wheat flour. When the agronomist has reached the limit of mere production it is possible that he may turn his attention to improving the flavor of his product. Until that time comes, however, we shall probably have to get along with the kind of corn the hogs find palatable.

BOOKS AND WRITERS

There continues to be a pretty brisk demand for weed-books, possibly because the subject of war gardens and conservation of food is uppermost in the public mind at present. Weeds deprive the crops of moisture, light, air and minerals and so reduce the food supply. Fighting our enemies by fighting the weeds is a form of war service in which even the most rampageous pacifist need not hesitate to engage. It has been some five years since W. S. Blatchley issued his "Indiana Weed Book," but a weed rarely changes its disposition, therefore the directions for eradicating the entire pestiferous brotherhood,

as given in this excellent little volume are as timely as if just issued. The author has arranged the weeds according to natural relationships and, after describing each in botanical terms, makes various observations on their harmfulness and gives methods of neutralizing their attacks on the crops. The author, a well-known nature lover, has even introduced a considerable number of appropriate quotations from the poets, though how anyone can wax poetic while holding a heated controversy with the weeds is beyond the comprehension of the reviewer. The book contains 185 pages and numerous illustrations and is a very good volume for the gardener and farmer to have at hand. It is published by the Nature Publishing Co., Indianapolis, and costs $1.25.

Gardening is undoubtedly one of the most popular of pursuits at present and is engaged in alike by novice, amateur and professional. As a consequence, garden books are becoming as plentiful and as conspicuous as dandelions on a neglected lawn though in most cases rather more useful. Frances Duncan, whose "Joyous Art of Gardening" was recently reviewed in these pages, has issued another book on much the same lines with the design of helping the novice over his troubles. The new book is entitled "Home Vegetables and Small Fruits" and is much like other gardening books except that it is rather more entertainingly written. It begins with observations on the soil and its improvement, garden plans and plant houses, and in due course considers all kinds of gardens and their management. There are also chapters on garden handicraft, small fruits, cultural directions for growing the usual vegetables, remedies for plant diseases and insect pests, as well as directions for storing, canning, drying and other schemes for preserving vegetables for winter. The novice should find this an interesting and helpful book. It contains 180 pages and forty illustrations and costs $1.40 net. Charles Scribner Sons, New York, are the publishers.

The instinct which inclines one to beautify his immediate surroundings by means of various decorative plants is characteristic of civilized man, but there are right and wrong ways of performing the work. The man who sets out his plants indiscriminately is not a landscape gardener. One must be something of an artist and enter into the spirit of the landscape to be successful. He must have constantly in mind the production of attractive pictures and alluring vistas in which water, sky, forest, and meadow are each considered with reference to the effect to be produced. The formal garden with its geometrical beds, its hedges and borders of clipped box, its sheared trees, and its balanced plantings was once considered perfection, but the tendency now is toward a style of planting which more nearly simulates nature. According to Frank A. Waugh, whose book "The Natural Style in Landscape Gardening" has just been issued by Richard J. Badger, Boston, "the natural style of landscape gardening endeavors to present its pictures in forms typical of the natural landscape and made vital by the landscape spirit." His book is an elaboration of this idea, as may be indicated by such chapter titles as "Form and Spirit", "The Landscape Motive", "The Art in Grouping", and "The Open Field". Those to whom a park is something more than a collection of trees, grass and flowers will find the book both entertaining and suggestive. It is not a manual of directions for producing desirable effects, but rather a presentation of certain artistic and philosophical aspects of the subject. The book contains 150 pages and there are a number of excellent illustrations from photographs made by the author. The price is $2.50 net.

Adolph Kruhm appears to have discovered a new style of gardening book and one that is likely to become immensely popular. It not only tells how to perform all kinds of gardening operations, but shows how to do so as well. At the top of nearly all of the 289 pages there is a clear photograph of

some phase of gardening—spading, raking, sowing, cultivating, thinning, weeding, transplanting and the like, while the rest of the page tells exactly how each act is to be performed. Among the photographs the cutworm is shown in his lair, cold-frames, hot-beds, and seed flats are seen in operation and fields of thrifty plants are displayed. The principle vegetable crops are illustrated in colors. It is difficult to see where the book could be bettered. And it only costs $1.25. This is the first book one should recommend to the beginner. It is entitled "Home Vegetable Gardening from A to Z," and is published by Doubleday, Page & Co., Garden City, N. Y.

Whenever a beginner in the study of trees applies to the reviewer for help, it is his custom to take down Emerson and Weed's "Our Trees: How to Know Them" and tell his questioner to turn over the leaves until he comes to his specimen. It is pretty hard for even the novice to go astray in this book, for each specimen is shown in flower, in fruit and in the winter condition. If any doubt remains, the full description of the plant, including much popular information, should make the identification certain. The book has thus far run through four editions and a new enlarged edition has recently appeared. The additional text is in the form of an introduction which discusses the growth habits of trees and mentions some of the newer kinds in cultivation. In the new edition there are 290 pages including 149 illustrations. It is published by the J. B. Lippincott Company, Philadelphia, at $3.00 net. In our opinion it is the best tree book yet published.

Dr. Edna Mosher has issued a very thorough account of the grasses of Illinois, as Bulletin 205 of the Agricultural Experiment Station of the University of Illinois. In addition to the scientific description of each species, there are given records of its occurence in various parts of the State. There are a number of excellent illustrations as well as usable keys, but the use of a brand of nomenclature, not sanctioned by the

botanists of the world will render the work unsatisfactory to many users. It may be a patriotic sentiment that inclines certain students to go in for an American Code but to the reviewer the attempt of a few Americans to bend the opinions of the rest of the world to their ways, seems very much like the tail trying to wag the dog.

Odor of Amelanchier.—Although various correspondents report that the common shadbush or June-berry (*Amelanchier*) is fragrant, Miss S. F. Sanborn notes that there is a form of this plant in her part of the world that is decidedly ill-scented, and that this fact is known to others. It is well within the bounds of possibility for the plant to be fragrant in one place and scentless or with an unpleasant odor in others. Those who have carefully tested the black snakeroot (*Cimicifuga*) are aware that it has two distinct emanations one of which is pleasing and the other quite the contrary. It is hoped that the ill-scented *Amelanchier* will be positively identified this year. There is always the possibility that the choke-berry (*Aronia*) which is ill-scented may be mistaken for it, though no botanist is likely to confuse the two.

Florets of Black-Eyed Susan.—The yellow rays of the Black-eyed Susans (*Rudbeckia hirta*) seemed as fresh as ever at the end of July. Why were the Silver-spot butterflies forsaking these bright flowers? Looking closer, I perceived the purple-brown disk flowers had almost all bloomed and withered; these plain florets are the ones that interest butterflies, because they contain the nectar. The blossoms begin to bloom around the base of the cone-shaped center and gradually open upwards. Into the fresh florets the bees and butterflies stick their tongues. Once, I brought a flower into my window. The next day a circle of stamens was prominent on the disk for the anthers were overflowing with yellow pollen. In the field this is not commonly in evidence, for the insects brush it off and carry it away soon after it appears.—*Miss Nell McMurray, Clearfield, Pa.*

Vol. 24. No. 3 Whole Number 118

THE AMERICAN BOTANIST

AUGUST, 1918

35 Cents a Copy; $1.25 a Year

WILLARD N. CLUTE & CO.

JOLIET, ILLINOIS

The American Botanist

A Quarterly Journal of Economic & Ecological Botany

WILLARD N. CLUTE, EDITOR

SUBSCRIPTIONS.—The subscription price of this magazine is $1.25 a year or $2.00 for two years, payable strictly in advance. The magazine is not sent after subscriptions expire. Personal checks on small or distant banks must contain ten cents for collection fees. The magazine is issued on the 20th of February, May, August and November.

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A TREE THAT OWNS ITSELF.

THE AMERICAN BOTANIST

VOL. XXIV. AUGUST 1918 No. 3.

Then the green rushes—O so glossy green—
The rushes, they would whisper, rustle, shake;
And forth on floating gauze, no jewell'd queen
So rich, the green-eyed dragon-flies would break,
And hover on the flowers—aerial things
With little rainbows flickering on their wings.

—Jean Ingelow.

A TREE THAT OWNS ITSELF

By H. E. Zimmerman.

AMONG the curiosities in the city of Athens, Ga., there is none of more general interest than the tree that owns itself. It is the only tree in the world that has this record. This famous oak is a majestic specimen of the forest that once stood at that part of the present city. All its companions have fallen at the hands of the woodman, but on account of the fact that the tree owns itself no ax has ever been laid upon it.

In the early part of the nineteenth century there lived in the town of Athens a gentleman by the name of Col. William H. Jackson. He owned the land on which this tree stands, and in his boyhood had played many a day beneath its protecting shade. He had an idea one day that after he was dead someone would cut down that tree; so he made a deed to the tree for eight feet of ground on each side, so that it could not be disturbed. Of course the deed was of no binding effect on anyone, but the sentiment was so beautiful that the tree has

never been molested from that day to this. Nor is it ever likely to be touched save by the tooth of Time.

Mr. George Foster Peabody, of New York, who has a great love for such sentiment, has taken steps to prevent the old tree from being molested. He has had granite posts placed around the land the tree owns, and these are connected by an iron chain. The ground has been filled in around the roots and plenty of good soil has been placed there to give the tree ample nourishment. A plate has been prepared with an inscription telling of the history of the tree.

A NEW FORM OF PRUNELLA VULGARIS

By J. C. Nelson.

ONE of the most familiar plants encountered by the collector in the northern half of the continent from Newfoundland to Alaska and extending southward to Florida, southern California, and the mountains of Mexico is the self-heal or heal-all, sometimes known as carpenter-weed. It seems able to adapt itself to a great variety of locations, growing on lawns and roadsides, in pastures and cleared ground, often on the borders of woods, and extending to considerable altitudes in the mountains. Unlike most Labiatae, it is not distinguished by any aromatic odor, but has enjoyed considerable repute as a medicinal herb, and was supposed by the early herbalists to possess great healing virtues in almost all kinds of diseases, particularly of the throat and respiratory organs.

The plant is common in Europe, and was described by Linnaeus in 1753 (Sp. Pl. 600) as *Prunella vulgaris,* although the pre-Linnean spelling *Brunella,* supposedly derived from the German *Braeune,* applied to various diseases of the

throat, for example croup and quinsy, for which the plant was a reputed specific, was adopted by Scopoli in 1772, and is still occasionally met with. American collectors for a long time assumed that our plant was identical with the European, but it early became evident to keen observers that considerable differences existed, and that while the European plant was undoubtedly naturalized in many places, American forms that were worthy at least of varietal if not of specific rank were clearly to be distinguished. These forms have been admirably treated by Professor M. L. Fernald in an article in *Rhodora* (Oct. 1913) under the title "Indigenous Varieties of *Prunella vulgaris*." He distinguishes five varieties, of which *hispida* of the eastern United States alone seems to be introduced; *aleutica* has been found only in Alaska, *atropurpurea* in California, *calvescens* in British Columbia and the northwestern United States, and *lanceolata* from Newfoundland to Washington and California, and even to Japan and China. The last-named form is very common here in Oregon, both in the desert and the humid regions, and from sea-level to high elevations in the mountains. These four indigenous forms differ from the original species chiefly in the narrower leaves, which range from one-fifth to one-half as broad as long, while in the species the range is from two-fifths to two-thirds. The varieties are also distinguished by having the base of the leaf narrowed or cuneate, while in the species the base is rounded.

The color of the flowers ranges from lavender through pink, bluish and violet to dark purple. As occasionally happens in flowers with this range of color, forms with white corollas are sometimes met with, agreeing in all other particulars with the typical forms. These "albinos" are therefore not to be regarded as constituting varieties, but as *formae,* and two of them have been included by Professor Fernald in the article referred to above: *P. vulgaris* forma *albiflora*, spar-

ingly naturalized from Europe in the eastern United States; and var. *lanceolata* forma *candida*, an indigenous form ranging from Quebec to Michigan. Doubtless each of the remaining varieties has its white-flowered *forma;* and it has been a matter of some gratification that I am able to add a third one to the list. In the course of last season's collecting, I found in a wet meadow near Salem a *Prunella* with pure white flowers which I at first supposed to belong to the var. *lanceolata*. Closer examination, however, showed that the floral bracts lacked the copiously bristly-ciliate margins that distinguish that variety, and that it should therefore be referred to the var. *calvescens,* which has been reported from British Columbia, Washington and Idaho, but seems hitherto to have escaped notice in Oregon.

Only two specimens were found, growing in tall grass, associated with *Centaurium umbellatum*. The smaller one, now before me, is 4 dm. in height, with one pair of leaves at the middle of the stem, three pairs close together near the base, and one pair closely subtending the spike. These leaves are rather smaller than in typical var. *calvescens* (stated by Professor Fernald to be 3-7 cm. long and 1-2.5 cm. wide), as the largest one is only 2.5 cm. long and 8 mm. wide. The bracts are green with pale purple margins, and the calyx is very slightly tinged with purple.

In order to comply with the requirements of the International Code for valid publication, I append the following brief diagnosis:

Prunella vulgaris L. var. *calvescens* Fernald, forma *alba* f. nov. Bracteis viridibus vel marginibus purpurascentibus sparse breviter ciliatis; calycibus purpurascentibus sparse setulosis; corolla alba. OREGON: wet meadow one mile north of Salem, July 10, 1917, *J. C. Nelson,* no. 1619 (TYPE in Gray Herb).

It is probably only a matter of time before each of the varieties will be shown to have its white-flowered *forma.* Variations of this kind may always be expected and should be made a matter of record; for while such contributions are separately of very slight importance, they are necessary to the complete understanding of a variable species.

THE BARBERRY AND THE WHEAT RUST

By Willard N. Clute.

WITHIN the past few months, a vigorous compaign has been waged against the common barberry (*Berberis vulgaris*) on the ground that it harbors a very destructive rust of cereal crops. A few States, indeed, have passed laws for its extermination within their boundaries, and a large number of recent graduates from our agricultural colleges have found an outlet for their patriotism, an opportunity to make a reputation, and more or less remuneration in endeavoring to exterminate the barberry, root and branch.

The common barberry is not an especially beautiful shrub and can well be spared from our future plantings, but there are a large number of parks, cemeteries and private grounds whose beauty depends to some extent upon plantings of this shrub made before war was declared upon it, and it behooves us to look carefully into the charges against it before getting hysterical over the matter and pulling them up. If such plantings threaten the health of the wheat, they should, of course, be exterminated forthwith; but if they do not, a reasonable time should be given the owners in which to replace the shrubs with something else. In any case, since the shrub is a possible source of danger, it should ultimately be removed, or at least reduced somewhat in numbers.

The wheat rust, which the barberry is accused of harboring, belongs to a group of fungi usually known as Basidio-

mycetes, or sometimes as Aecidiomycetes. There are possibly ten thousand rusts, all parasitic upon various species of green plants and in many cases confined to a single species of host plant. One of the most important and interesting facts about them is that a large number require more than one species of plant for the completion of their life cycle. Thus the rust of apple passes part of its existence on the cedar, the corn rust begins life on the oxalis and the wheat rust has one of its stages on the barberry. Some of these rusts have no less than five different kinds of spores, each in its proper place in the life cycle and each carrying the rust to new areas of infection, all of which shows how powerful for harm some of the species are.

The botanist knows the wheat rust as *Puccinia graminis*. Under this name, however, are included at least half a dozen forms, some of which affect wheat, while others injure rye, oats, barley and various wild grasses. It is likely that all may live on the barberry, but unless they happen to be of the right form, they cannot harm the wheat though they may attack other cereals if they be in the vicinity. The rust is especially fond of *Agropyron repens*, the well-known quick-grass or quack-grass. One might be willing to donate a bushel of wheat now and then, if the rust would only run this pestiferous species out of existence.

Under favorable conditions, the wheat rust begins its life cycle in spring on the leaves of the barberry. Here the fruiting parts form thickened cushion-like growths from one to several times the diameter of a pinhead. Spores from these bodies are blown by the wind to wheat plants in the vicinity and there set up an infection which later manifests itself in rusty patches on the leaves and stems, and greatly reduces their vigor. From the plants on the wheat new spores are given off to set up new infections, and so spread the mischief. Along toward the end of the season, two-celled, dark-colored spores are produced, and these survive the winter and in spring

set up the infection on the barberry again. From the foregoing it would seem that all that is required to forever remove the danger from rust is to remove the barberry, thus breaking its life cycle, but the rust is not so helpless as all that. If no barberry is at hand the rust merely omits that part of its life cycle and sets up its infection directly upon the wheat. In India and Australia, where the barberry does not grow, the wheat rust is well known. Removing the barberry, then, is only one step in the effort to curb the pest. A second interesting fact is that the further South one goes the less is the barberry concerned in spreading the wheat rust. In warm regions the summer spores survive the winter and propagate the rust, and the autumn form or black rust, if it occurs, does not seem to affect the barberry. In cooler regions the barberry is often heavily rusted in spring, though there may be extensive areas where it is not affected. The connection of the barberry and the wheat rust has been suspected for a very long time. Laws were frequently made against the shrub, but it has continued to hold its own. A half century ago, the State of Massachusetts ordered its extermination.

From the facts here presented, it is very apparent that while the barberry is not the only method by which wheat rust is spread, it may on occasion contribute to this end and should be rooted out, especially in the vicinity of wheat fields and other cereal crops. In cities and towns, far removed from grain fields, it is probably not a very great menace, but since it is not especially ornamental it should be replaced as soon as possible by less dangerous and more decorative shrubs. Spiraeas, hydrangeas, golden bell, snowball, ninebark, mock orange, rose-of-sharon, lilacs and an immense number of other floriferous shrubs will grow wherever barberry will, and are far superior to it. Lastly, the Japanese barberry, so extensively planted for hedges, is not affected by the rust and need not be disturbed.

BLOSSOMS BY THE WAYSIDE IN THE ROCKIES

By Blanche H. Soth.

REMINISCENT hunters, hikers and fishermen invariably omit mention of one form of wild life that is rampant in the scenes of their experiences. They never tell us anything about the wild flowers. If it were not for scattered phrases such as "shelter of the timber," "pasture for the horses" and "brilliant with flowers," one might suppose that the places that they visit were destitute of vegetation. Do they mentally classify all the yellow blossoms as "sunflowers,"and call all the blue ones "blue bells?"

The native of the middle west takes it for granted that there will be violets and sweet-williams by the river roads in the spring and iron-weed and golden-rod in the pasture lots in August. Does he notice when he cruises westward that these familiar flowers give place to yucca and prickly poppy? Doesn't he see the prickly pear until he steps upon it, or marvel at the evening glow of the western star unless its foliage sticks to his coat to make him notice it?

Of course, I don't expect you to turn aside from the highway to "botanize," but I would have you note in passing the exquisite rosy funnels of the bush morning-glory which, by the way, has a root as big as your head, and look with comprehension upon the Rocky Mountain snow-ball, the evening primroses and the paint brush. Take a little interest in the great number of butter-fly shaped blossoms, lupines, vetches, buck-beans, loco-weeds, and milk vetches, of which genus alone

there are over seventy species in cur region. Some of them are called "rattle-weeds" because the seeds rattle in the dry pods in the autumn, others are "ground-plums" from the shape and size of the enlaged seed vessels.

Having reached the mountains your road will follow up some canon. Do not lose a minute from the business of the

Mariposa Lilies.

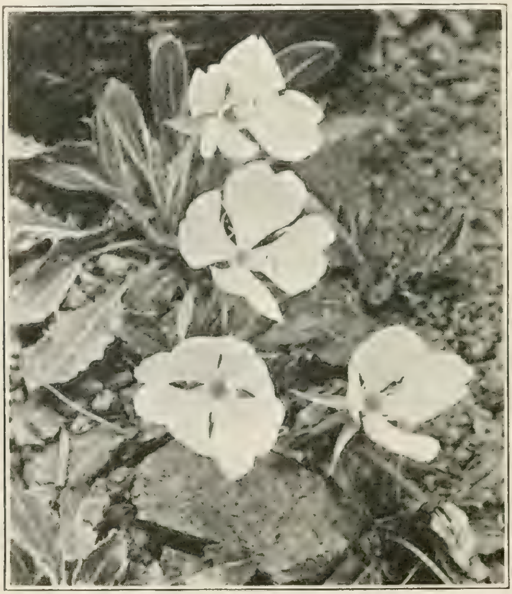
trail to seek the orchids and the pine-drops that live in the seclusion of the deep coniferous forests,

"For every weed's a wild flower
And every briar's a rose."

and even he who motors through our mountains may glimpse the glory of the flowering shrubs, our pride and the visitor's delight. There are the wide, white saucers of the false raspberry and the snowy plumes of the holodiscus on the creek banks, wax-flower and nine-bank on the hillsides and wild roses everywhere.

Watch for the bed-straw's foam and fragrance by the spring and the phacelia's fur and fuzz along the road. The

polemoniums have hearts of gold and the evening primroses on that ruddy gravel slide blush as they wither in the sun's too ardent gaze. Don't overlook that bunch of scarlet, cylindrical flowers that leans out at you from the cliff. It is the scarlet beard-tongue and you are looking at one of the rarest of flower colors. Out of 2700 species of Rocky Mountain flowers less than 30 show a true scarlet color. See those smooth beard-tongues on the railroad grade, like fallen scraps of "Heaven's



Evening Primroses.

own blue," and look at that patch of blue a mile or so ahead of you. What is it? Acres of tall, straight one-sided beard-tongues growing so close together that there's no room for the green of their leaves or of the grass to show through.

Here the road passes through a bit of wood land and you will catch glimpses of sprite-like columbines, the fraseras' stately cream-colored spikes, fairy Mariposa lilies, golden orbs of the sun-flower tribe and perhaps some belated "anemones."

Now you are skirting a wet meadow-land; there's lungwort as tall as a man, twinkling stars of blue-eyed grass, exploded swirls of shooting stars, beds of aromatic mint, mats of silver-weed and a few red mountain lilies.

On that burned over ground you'll see purple thistles, pink fireweed, sometimes called "willow-herb" from the shape of its leaves, the gilia's rosy trumpets and the false forget-me-not's baby blue.

To the very tops of our mountains you'll find them, zygadene, bistort, daisies, buttercups, forget-me-nots, saxifrage, orpine and hundreds more, crowding each other for possession of every inch of soil.

As the season advances, asters follow the daisies and golden-rod, sage and gum-weed come into flower. Everywhere

> "You'll see gems in yellow
> Nodding, each one to his fellow."

for sunflowers, ragworts and their like gild every nook and cranny. Cotton-grass and gentians glow on the creek banks long after the first frosts have chilled the night air. I have found perfect blossoms of northern gentian and potentilla above timber line in October; and asters, rabbit-brush and torch-weed are often quite brilliant on sunny spots in the foot hills as late as November.

Whether you are fishing in June, hiking in July, camping in August or hunting later in the season, the flowers are always by your path. Whether or not your trip is successful in other ways, you've but to look as you pass to gather for yourself rich plunder from the vegetation of our hills. Long after the more material impressions have passed away your soul will revel in recollections of the blossoms' gold, the silver of the leaves, little emerald hollows that flashed in the sun, radiant amethystine swales, and rich bits of glowing blue, like scattered chips of turquoise float from the mother lode of the kindly sky that overhangs it all.

THE SMYRNA FIG IN AMERICA

By Mark Bennitt.

THE largest fig garden in the world is situated in the northern suburbs of Fresno, California and is owned by Henry Markarian. It consists of 160 acres of trees planted sixteen years ago and now yields about 400 tons of dried figs annually. More than 3,000 of the trees are of the Smyrna type, the others being principally the white Adriatic and the Mission black fig, which were introduced into California by the Spanish missionaries from Mexico about 1769.

It was the writer's good fortune to visit Mr. Markarian's wonderful orchard in mid-June when the pollination of the first crop was taking place. Men were carrying bags, boxes and baskets of green figs into the orchard, stopping at each tree to leave a handful or two in small wire baskets holding about a quart, or hanging wreaths of eight or ten figs each on small limbs well within the trees Without some previous knowledge of fig culture, or an explanation from Mr. Markarian, a casual visitor would not have suspected the nature of this work. It was the practical working out of a riddle that perplexed one of California's foremost men for a quarter of a century.

The figs which the workmen were placing in the Smyrna trees were the wild or caprifigs containing the fig wasp (*Blastophaga grossorum*). This wasp develops only in the caprifig and by placing these figs in the Smyrna trees at the proper time, the wasps leave them and, carrying a load of pollen grains on their bodies, enter the young Smyrna figs and pollinate the hidden flowers. Unless so pollinated the figs shrivel and drop off.

The effect of pollination is noticeable within two or three days in the swelling and rapid development of the fig.

The presence of the *Blastophaga* in the United States is due to the efforts of George C. Roeding of Fresno. He planted a garden of 60 acres of Smyrna trees and after 14 years of effort, succeeded in producing these figs by artificial pollination. This memorable event was in 1890, but ten years were to elapse before he was able to grow them commercially with the aid of the *Blastophaga*. It became evident to Mr. Roeding that there must be a way in which the figs are pollinated naturally and he set about solving the riddle. He found that the figs of commerce were produced principally in the Maeander valley about forty miles from the city of Smyrna in Asia Minor where the secret of growing this largest, sweetest and most valued fig of all the Mediterranean countries was closely guarded, as it had been for centuries. Mr. Roeding enlisted the co-operation of the United States Department of Agriculture with the result that the fig wasp was established at Fresno. Specimens of the first commercially grown Smyrna figs from California were exhibited at the Pan-American Exposition in Buffalo in 1901. The California Smyrnas are called Calimyrnas. Thousands of acres of Smyrna trees have since been planted in the San Joaquin valley, and in a few years the source of the permanent supply of figs will swing from the Mediterranean East to our Pacific West.

The *Blastophaga* wasp is an almost microscopically small insect. It is about one-twentieth of an inch in length with a spread of wings twice its length. The male is wingless. The caprifig bears three crops annually called respectively, the profichi, the mammoni, and the mamme. The mamme is the hold-over crop and consists of a few scattered figs on the old wood. These form late in the season and carry the generation of *Blastophagas* over from one year to another. During this period, the wasp is in the pupa stage in minute galls in the fig. With

the beginning of growth, the fig develops, the mature insect emerges and, after mating, leaves the fig and seeks to perform her sole function in life, the perpetuation of her species. By this time the profichi or first crop of the caprifigs have developed to sufficient size to be ready for the wasp and in this crop the new wasps develop which carpify or pollinate the Smyrna figs. In the profichi the life cycle of the wasp is the same as in the mamme crop, but much more rapid.

By the 10th of June, at Fresno, the Smyrna figs are large enough to receive the wasp. In order to control the pollination of the orchards satisfactorily, most growers plant the caprifigs by themselves—about one tree for each twenty Smyrnas. The figs are then picked and distributed as described. In the dry warm climate of the San Joaquin valley, the figs dry rapidly and the supply in each basket has to be renewed every three days. Some of the fig growers plant the capri trees throughout the orchard and depend on the *Blastophaga* finding its way to the Smyrna figs. The best results, however, are secured by the hand distribution of the figs. There are several forms of the caprifigs which develop at different periods so that by judicious planting the supply of the *Blastophaga* is extended through the long season of development of the Smyrna figs. The luscious, nutty flavor of the Smyrna fig is attributed to the development of the seeds through pollination. The seeds of the white and black figs are inert unless pollinated in a similar way. These latter figs develop without pollination, but some growers contend that the flavor is improved by pollination.

The number of wasps developed in a single caprifig approximates 1500 to 2000. As the female wasp leaves the fig, she passes through the center of the inflorescence, dusting her body and wings with pollen grains to the number of about 4000. By looking at the tiny speck which marks the opening into the fig, when the sun is brightest, one may see the flashing wings

of the female wasp as she frantically struggles to enter the fig. Once inside she does not emerge again but having pollinated the flowers, she is absorbed by the fruit. While a single wasp is considered enough to pollinate a single fruit, several wasps are often found within a fig. The male wasp never leaves the fig in which it is hatched and the female is short lived unless she finds her way into a fig. Eighty percent die within five hours, and all within ten hours after emerging. Within the fig the life may extend over several days.

In Mr. Markarian's orchard are single trees which yield as high as 500 pounds of dried Smyrna figs a season, due to the thorough carprification. The price of Smyrna figs, wholesale, in 1918 is 20 cents a pound, of the white figs 15 cents, while the black figs bring 11 cents in the Fresno market. The fig tree has few or no diseases. It responds to good cultivation and calls for the same attention that any other crop requires to be profitable.

[Readers unfamiliar with the structure of the fig fruit, may be interested in knowing that it is really a transformed and hollow branch with a large number of very minute flowers inside it. Notwithstanding the differences that exist between the caprifig and the Smyrna fig, they are merely different forms of one and the same species. It is probable that the edible form is the result of selection for ages during which it has been brought to such difference in form and flavor as to be valuable, but the fig wasp, having been born and bred in the wild species, continues to favor it. The hold-over crop of the caprifig has staminate and gall flowers, the latter harboring the fig wasp. The spring crop of the caprifig has staminate, carpellate and gall flowers, but the Smyrna fig has only corpellate flowers. —Ed.]

ACCENTING LATINIZED PROPER NAMES

THERE appears to be no agreement at present among botanists as to the accent of certain Latinized proper names. This is a matter that should be remedied, and various efforts have been made in this direction. In this connection, Dr. W. F. Ganong has addressed a letter to the Secretary of the Joint Committee on Horticultural Nomenclature, part of which is published herewith as a matter of interest:

I have been very much interested in the movement now in active promotion by your committee to standardize both the scientific and common names of plants. The matter concerns me from an educational standpoint, and I am hoping your work will prove of benefit to teachers as well as horticultural workers. Your invitation to send suggestions leads me to speak of one matter which from an educational point of view at least is certainly important. The scientific names of plants are of course to be pronounced as well as written, and hence your list will ultimately, I presume, give the pronunciation as well as spelling of the names, precisely as Bailey's *Cyclopedia* does in the text throughout the work. There is one point in Bailey's otherwise wholly admirable work in which I think he is not correct. In giving the pronunciation of 4-syllabled species names which are personal names in the genitive case, he uses the termination *ii* very correctly, but throws the accent on the word backward, in order to keep as nearly as possible the pronunciation of the name, e. g., *Wil*sonii. This makes a practically unpronounceable combination. I have discussed the matter with Professor Bailey, and he tells me he assumes in such cases the two i's are to be sounded as one. This, however, is impossible if the word is considered as Latin at all,

for anyone having the least knowledge of that language would sound both i's. If both i's are retained, according to the rules of the Vienna Congress, then I take it the word should be sounded Wil*son*ii, according to the usual rules of Latin pronunciation. Professor Bailey appears to me to be combining in these words English and Latin features, which rather seems to stultify the system of scientific nomenclature. I think the words should either have only one i, despite the rules of the Vienna Congress, and be pronounced *Wil*soni, or else be treated as Latin and sounded Wil*son*ii. I may add that I have discussed the matter with the editors of Gray's *Manual*, and find that their views and mine are entirely concurrent on this matter. I think it is one which sooner or later your Committee will have to face, and hence I submit to you these data.

AN ADDITION TO OUR FOOD PLANTS

By J. C. Nelson.

I take pleasure in reporting an addition to the list of useful plants, which is unique in being also probably the first reported occurrence of the species in the United States.

While on a collecting trip along the Oregon coast in the vicinity of Newport, Lincoln County, in August, 1915, I found growing on the beach at the base of the cliffs on Yaquina Head two specimens of a plant that was entirely new to me. It was past the time of flowering, but had a raceme of globular pods about the size and shape of peas, and large, thick glaucous leaves like those of cabbage. Beyond the fact that it belonged to the Cruciferae, I could make nothing of it. On sending a specimen to the Gray Herbarium, it was determined as *Crambe maritima L.*, the "sea-kale" or "sea cabbage," a plant native to the west coast of Europe and the shores of the Black and Baltic Seas. I supposed that it was a mere waif on our coast,

and would not survive the winter storms. On revisiting the spot in July, 1918, I was delighted to find that it had not only persisted, but that the original colony has increased to some twelve vigorous specimens, with numerous plants beginning to appear. I conclude, therefore, that it has come to stay, and may safely be regarded as a permanent addition to our flora.

There is no specimen of it from the United States in either the Gray Herbarium (except my own), the National Herbarium, the Rocky Mountain Herbarium at Laramie, Wyoming, the herbarium of the New York Botanical Garden, or that of the University of Washington, so I feel justified in assuming that this is its first recorded appearance in this country.

The genus was established by Tournefort in 1735, and given the name *Crambe,* which is Greek for cabbage, the true cabbage being placed by the same author in the genus *Brassica,* the Latin word of the same meaning. There are about twenty species, natives of Europe and Western Asia. The flowers, which I have not yet seen, are said to be white, honey-scented and rather showy. Mr. J. F. Macbride of the Gray Herbarium informs me that *C. maritima* is "apparently well known, especially in England, as a cultivated food-plant, but rarely grown in America, although said to be worthy of cultivation. It requires the same care as rhubarb, and the young shoots are blanched by covering after growth in the spring. The white shoots are then prepared as asparagus."

If any readers of *The Botanist* have had any experience in the cultivation of this plant, it would be interesting to hear from them. The taste of the raw leaves is almost exactly that of cabbage, but there seems to be no tendency to form a head, the aspect of the plant being very similar to that of the common kale.

[The editor has long grown this plant in his garden from roots sent out by the U. S. Department of Agriculture.

It is one of the few species able to form adventitious buds on its roots and may be easily multiplied like horse-radish. It stands the winters of Northern Illinois without protection and begins to push up early in spring. At this time earth is heaped over the buds to the depth of perhaps a foot, and when the sprouts show at the top of this, the earth is removed and the sprouts cut off level with the soil. The stalks are usually eaten like celery. They have a distinct salty flavor and are otherwise much like a bit of raw cabbage, though much tenderer.—Ed.]

THE INDIGEN AND THE CULTIGEN

IF an author were to prepare a flora or manual of cultivated plants in any country, he would come hard against the fact that he deals with two gentes or types of species One gens has recorded origin, with the typical form well recognized and probably represented by a type specimen in the herbarium of the person who founded the species. It is an indigen of known habitat. The other gens is a domesticated group of which the origin may be unknown or indefinite, which has such characters as to separate it from known indigens and which is probably not represented by any type specimen or exact description, having therefore no clear taxonomic beginning. I trust I may be pardoned for calling such species or group a cultigen.

A good example of the cultivated indigen is *Thuja occidentalis*. Although there are many horticultural forms of this, their relationship is understood. We are familiar with the species in the wild and we have the whole case before us. The variations under domestication are indeed great, but we readily range them with what we call the species itself.

A good example of the cultigen is *Zea mays*. We know neither its country nor its origin. It is widely variable. If a botanist had before him good material of all these variations

I do not know which one of them he would take as the type. It is a composite gens with no clear taxonomic center from which variations diverge.

Here we have two classes of facts with no way of expressing one of them. If *Zea mays* were an isolated case, we could treat it as an exception but I have before me a list of one or two hundred comparable cases and yet I have made no careful search. Botanical literature is full of cultigens, improperly or incompletely co-ordinated into taxonomic treatment.

The prime deficiency is the fact that many of the good cutigens are unrecognized botanically. In the presumed manual of cultivated plants, how would the author treat the tuberous begonia? Would he enter descriptions of the several indigenous species from which the cultigenous group has come, and stop there? But what then, would the horticulturist do? He would say that *Begonia Veitchii, B. Rosaeflora, B. Davisii, B. Pearcei, and B. Clarkei* are not in cutivation as far as he knows and he asks what he shall call the tuberous begonia. He would charge that the tuberous begonia had been left out and he would be correct.

What are we to do with the cultivated blackberries, ixias, gladiolus, fuchsias, and many of the magnolias, deutzias, spireas, pandanus, roses? What are we to do with the cultivated canna: what is this plant? Are we merely to pass it by undescribed because it is a complex? To describe the various species of canna is of no consequence to its identification. At present there is no name under which we can describe the common garden canna. The point is, are we to name and describe cultivated plants or are we not? The cultigens are with us and the numbers will increase. No longer can we let them go by default. The plant breeder will bring his new groups; will taxonomy expand itself to receive them or must they forever remain outcasts? Even if we are satisfied to say that the cultivated blackberries are *Rubus Allegheniensis,* what are we to say when *R. Allegheniensis* is itself split into a dozen segregates?

It is said that to admit such forms into the society of recognized species would greatly disturb botanical procedure. The replies to this position are two: (1) we have already admitted very many of them, even if under protest in some cases; (2) is botanical procedure to be competent to accept the facts of nature? Whether we will or no, these cultivated things will be known by botanical names. What are we to do with *Phlox decussata*? It may be a set of hybrids between *Phlox paniculata* and *P. maculata*, but we cannot order the plant from the nurseries under either of these names. Referring the name *P. decussata* to one or the other of the species may satisfy the demands of synonymy but it does not dispose of the plant. It is a good name for the group. Why not use it?—*From an article by L. H. Bailey in Science.*

TWO FORMS OF LEAVES ON THE SAME PLANT

THE philosophers are fond of telling us that there are no two objects in nature exactly alike, though there are many, such as grass blades, so nearly alike that the differences are not apparent. As a usual thing, the shape of leaf on any species of plant is so nearly true to form that it often serves as a distinguishing character. There are, however, some

species which have the trick of producing two or more forms of leaves on the same plant and often on the same twig. The sassafras is the classical example of this. Besides leaves with entire margins which it bears in common with its cousin the spice-wood (*Benzoin*), it also produces "mitten-shaped" leaves in which there is a projection or lobe on one side. Frequently still another lobe is borne on the opposite side. The mulberry usually has leaves that are lobed in a similar manner and the white poplar produces leaves that range from ovate and entire to three lobed. The honey locust (*Gleditsia*) regularly produces both pinnate and twice pinnate leaves. On the other hand, several species, which have normally pinnate leaves, notably the black locust and the mountain ash, may now and then produce specimens with simple leaves. The orange is well known for having a blade that is joined to the leaf stalk in such a way as to indicate that it is not a leaf but a leaflet—all that is left of a once pinnate leaf. In this connection the leaves of the golden leaf oak or white live oak (*Quercus chrysolepis*) shown in our illustration will be of interest. The forms shown were all taken from a single twig sent to us by Mr. L. E. Smith of Sisson, California. Mr. Smith writes that this is a common tree along the Sacramento river. The leaves seem quite analagous to those of the new form of shingle oak mentioned in a recent number of this magazine.

In *Forest Leaves* for April an illustration is given of a form of the shingle oak which has lobed leaves and which is regarded as a hybrid between the shingle oak (*Quercus imbricaria*) and the pin oak (*Quercus palustris*). The shingle oak frequently forms hybrids with other oaks, and it is possible that the specimen reported by Mr. Bates in this magazine for November, 1917, as *Quercus imbricaria heterophylla* may be the same species.

FLOWERS OF VARYING COLOR

By Willard N. Clute.

A good many years ago, the French botanist, DeCandolle, observed that flowers tend to fall into one of two series. In one of these the color of the blossom varies from green through blue-green, blue, blue-violet, violet, and violet-red to red, and in the other it varies from green to yellow-green, yellow, yellow orange, orange and orange-red to red. The first series, called the cyanic series, may be said to have blue for its type and to be capable of varying to red or white, but never to yellow. The second, or xanthic series, has yellow for its type, and may vary to red and white but never to blue. Roses, dahlias and tulips belong to the xanthic series and really blue roses, therefore, are probably beyond the possibilities. The phlox and larkspur, on the other hand, are members of the cyanic series and do not give clear yellows. A second interesting difference between the flowers of the two series is that in the xanthic series the colors are usually due to small colored bodies, called chromoplasts, in the substance of the cell, while in the cyanic series the colors are dissolved in the cell sap. For some unexplained reason, pure white (albino) flowers are much rarer in the xanthic than in the cyanic series. In the latter we expect to find white forms if we search long enough. In typically yellow specimens of the other series, we rarely if ever find them. As abundant as dandelions are, nobody has ever reported a pure white one. It is worth mentioning that while single species keep pretty closely to one or the other of the series, the genus as a whole may not do so. Different species may be blue, red, white or yellow.

Much of the beauty of our flower gardens is due to the variations in color which these flowers present. A few flowers of more than one color may appear regularly in nature, as in the case of hepatica and the painted-cup, but usually the variations first appeared as sports and have since been continued artificially. A partial list of species with this peculiarity is given on another page, but it is likely that it can be greatly extended and records to that end are invited. In considering the matter, changes of color in a single species only should be reported since, as we have indicated, the different species of a genus may be differently colored.

Closely connected with variations in color is the habit some plants have of changing color as the blooming season progresses. The most familiar of such changes is the pink color that often appears as the flower begins to wane, but a large number of other changes may be noted by an attentive observer. Some of the more conspicuous are listed here, but other records are desired.

As a general rule, flowers tend to be of a single color or, when more than one color is present, the others occur as lines, dots and blotches. There are a number of species, however, that have two distinct areas of color. Some of these are also listed. As for the albinos, although the casual observer may be inclined to consider them worthy of a separate name and describe them in sounding Latin terms, they are really to be expected in the cyanic group of flowers, as we have indicated, and at some future date we intend to make a list of them. Quite analogous to such forms are pink forms of typically blue flowers, yellow forms of typically red forms, and red forms of typically yellow flowers. All such are worth listing.

FLOWERS WITH TWO OR MORE COLOR FORMS.

Aster (*Callistephus hortensis*), blue to red.
Butterfly weed (*Asclepias tuberosa*), yellow to red.
California poppy (*Escholtzia Californica*), yellow to red.
Canada lily (*Lilium Canadens*), yellow to red.
Chrysanthemum (*Chrysanthemum Sinense*), yellow to red.
Canna (*Canna Indica*), yellow to red.
Cock's-comb (*Celosia aristata*), yellow to red.
Dahlia (*Dahlia variabilis*), yellow to red.
Four o'clock (*Mirabilis jalapa*), yellow to red.
Gladiolus (*Gladiolus Gandivensis*), yellow to red.
Hollyhock (*Althaea rosea*), yellow to red
Hyacinth (*Hyacinthus orientalis*), blue to red.
Larkspur (*Delphinium consolida*), blue to red.
Morning glory (*Ipomea purpurea*), blue to red.
Nasturtium (*Tropoelium majus*), yellow to red.
Phlox (*Phlox Drummondii*), blue to red.
Portulaca (*Portulaca grandiflora*), yellow to red.
Rose (*Rose sp?*), yellow to red.
Rose of Sharon (*Hibiscus Syriacus*), blue to red.
Snapdragon (*Antirhinum majus*), yellow to red.
Salpiglossis (*Salpiglossis sinuata*), yellow to red.
Tulip (*Tulip sp?*), yellow to red.
Verbena (*Verbena hybrida*), blue to red.
Zinnia (*Zinnia elegans*), yellow to red.

FLOWERS THAT CHANGE COLOR.

Cotton (*Gossypium herbaceum*), cream to pink.
Trillium (*Trillium grandiflorum*), white to pink.
Hound's tongue (*Cynoglossum officinale*), red to bluish.
Bush honeysuckle (*Diervilla trifida*), yellow to orange.
Lantana (*Lantana camara*), yellow to orange.
Alkanet (*Anchusa Italica*), pink to blue.
Lungwort (*Mertensia Virginica*), pink to blue.
Japanese honeysuckle (*Lonicera Halliia*), cream to yellow.

BI-COLORED FLOWERS.

Rose mallow (*Hibiscus oculiroseus*), limb white, throat crimson.
Halberd-leaved mallow (*Hibiscus militaris*), limb white, throat crimson.
Bird foot violet (*Viola pedata var*), upper petals maroon, lower lavender.
Man of the earth (*Ipomea pandurata*), limb cream, throat red.
Narcissus (*Narcissus poeticus*), perianth white, tube yellow.
Gaillardia (*Gaillardia aristata*), outer half of ray yellow, base red.

NOTE *and* COMMENT

Sedum Ternatum in Illinois.—On a recent visit to Rock Creek, Kankakee County, in Eastern Illinois, an extensive colony of *Sedum ternatum* was found on shaded rocks along the stream. Although it is possible that the plant is an escape, as it sometimes is in the Eastern States, the location, in a wooded ravine a long distance from any house, rather points to the conclusion that it is native. The Manuals give its western range as from Michigan to Indiana and Georgia, but it is apparent that Illinois should also be included.

Waste Lands of the United States.—Botanizers who are uneasy for fear cultivation will obliterate all the good collecting grounds may be reassured. A recent survey shows that in continental United States there are some 1,900,000,000 acres and of this area, more than half—about a billion acres—are not even included in farms. Of what is commonly regarded as farm lands about 40,000,000 acres annually lie fallow, 90,000,000 acres are used as pasture and 20,000,000 acres about buildings are not used for crops. Apparently good botanizing territory will be abundant for some time to come.

Weather and Honey Flow.—Investigation has shown that the activities of the bee, as well as those of other agriculturists, depend very largely upon the weather. Clear, rather warm days favor honey production and so does a low barometer. More than half the honey crop is made in June (in Iowa), but this is apparently a seasonal phenomenon and not connected with any particular month. It probably occurs

at the height of the blooming season of some particularly abundant honey plant, and may well vary with the locality and even with the flora of the region. As would be expected, a rainfall somewhat above the average is favorable to the production of honey, since it not only promotes the growth of the plant but supplies moisture for the nectar as well. In dry seasons, even good honey-producers yield little or no nectar.

Sassafras Once More.—Our old friend, the sassafras, is up for a change of name, although it has had rather more than its share of change in recent years. For a century or more the name of the plant stood unchallenged as *Sassafras officinale,* but when the friends of the "American Code" got busy, the highly tautological *Sassafras sassafras* was substituted. Then the adherents of the Vienna Code stood out for a new name and the plant became *Sassafras variifolium.* This was regarded as the really and truly correct name of the plant and it now stands thus in all up-to-date manuals, but somebody has recently discovered that the specific name, *variifolium*, has been incorrectly applied, and the name automatically becomes *Sassafras officinale* again. Let us hope that the name-tinkers derived some benefit from this cycle of changes; it is not apparent that anybody else got anything out of it except trouble.

Sumach for Tanning.—Nearly all plants contain a certain amount of tannin but the tanning industry can use only those species which produce this substance in quantity and in easily obtainable form. Up to the present, the chief sources of tannin have been the barks of different trees. In the United States, oak, hemlock and chestnut barks are most frequently used. The roots of canaigre (*Rumex hymenosepalus*), a plant related to the sorrel and rhubarb, contain much tannin and also are used to a limited extent. In Europe the leaves of a species of sumach (*Rhus coriaria*) are used for tanning certain fine leathers used in gloves and the like, and this material is imported into the United States in some quantity, though

there does not seem to be any need for it since two of our native sumachs—*Rhus hirta* and *R. glabra*—contain the same constituents. According to the Department of Agriculture, the diminishing supply of tanning materials has now made these species of commercial importance, and children are said to be able to make good wages collecting and drying the leaves for market. A bulletin is soon to be issued on the subject. There is certainly no lack of the sumach. It grows extensively in the most sterile soils. All depends on the price. If this is high enough, our waste lands may soon have a new value.

Honey Production.—The United States Department of Agriculture estimates that the honey crop for 1918 will approximate two hundred and fifty million pounds. When it is recalled that the nectar in flowers does not become honey until it is worked over and partly evaporated by the bees, the magnitude of the labor in which they engage is apparent. These industrious insects must move fully 150,000 tons of material during the season in making the honey crop, to say nothing of the honey consumed by the bees themselves. The labor seems out of all proportion to the insect. The best all-round honey plant is reported to be the white clover. About half the honey produced is gathered from this plant. Next in importance comes alfalfa, followed closely by sweet clover. In some regions the latter is the chief honey-producer. A good deal of honey is gathered from the general run of flowers, but the plants that produce a honey that can be identified are not many. The principal species are cotton, basswood, tulip tree, buckwheat, goldenrod and mountain sage. In the tropics the logwood, one of the legumes, produces much honey. At present, California produces about one-fifth of the honey crop. Other honey-producing states, though far behind California, are New York, Texas, Michigan, Iowa, Colorado, Wisconsin, Missouri and Pennsylvania.

Spring Flowers in Autumn.—The flowers of early spring are almost without exception produced by perennial species that store up food in their stems or other underground parts over winter. They are thus able to spring into bloom without waiting to put up stem and leaves as the summer flowers are obliged to do. Many of the summer flowers are perennials, also, but if they store food at all, this is not sufficient to carry them through the period of flower and fruit formation. The spring flowers, also, usually have a remarkably short period of vegetative activity. By the time the forest trees have fully spread their leaves, all traces of many of them have entirely disappeared above ground, yet in this short time they have accumulated enough food to carry them through another season. Their vegetative habits give them a great advantage over other plants and permit them to live in the forests where summer flowering species would find it difficult to grow. Additional interest is lent to this group from the fact that specimens are frequently found in bloom in autumn. The flowering is rarely, if ever, general, but here and there in the woods and fields one comes upon specimens. Certain seasons seem to affect the result. A dry, hot summer, followed by a cool, moist autumn is usually most productive of the phenomena. It is well known that heat and cold have similar effects upon plants. In forcing flowers to bloom out of season the florist finds that dipping the dormant plants in boiling water has the same effect as freezing them. They develop much sooner under such treatment. After a hot summer some of the spring flowers act as if spring had come again. It may be well to remember that certain plants, the madonna lily for example, have two growing seasons, one following winter, when it blooms, and one following summer when it merely puts out a new set of leaves. The bird-foot violet not only has two seasons of growth, but has a different shaped leaf for each season. All our violets show a disposition to bloom twice a year.

Another of the Horrors of War.—The expert writers who undertake to enlighten us through the popular magazines on the technical details of war-construction, sometimes stray from their chosen field into the realms of pure science, with results often more amusing than edifying. An illustration of this is afforded in Mr. L. C. Everard's article on "Treenails" in Munsey's Magazine for August, 1918. In discussing the substitutes that have been used to replace the shortage of black-locust in the manufacture of the above-named useful elements of ship-construction, he names the Osage orange, "which," he goes on to say, "is also called *bois d'arc*, meaning 'wood of the ark,' on accoount of its durability." This comes as a severe shock to those of us who were brought up to believe that *bois d'arc* means "bow-wood," and was so called by the French voyageurs because its toughness and elasticity well adapted it for the making of bows. This popular name was neatly put into Greek by Sargent, who called the genus *Toxylon,* now unfortunately superseded according to the rules of priority by Nuttall's much more prosaic *Maclura,* in honor of the early geologist, William Maclure. If Mr. Everard will look at his French dictionary, he will find that *arc* never is used to mean ark, but that Captain Noah's super-transport is designated by the word *arche*. Whether it was constructed of particularly durable wood is one of those matters that must be left to conjecture, inasmuch as the only information given in the Scriptural account is that it was built of "gopher-wood," which has never been satisfactorily identified, though the weight of critical opinion seems to incline toward some coniferous or resinous wood.—*J. C. Nelson.* [Professor Nelson should know by this time that writers of popular science do not have to be accurate. The more remarkable the item the easier it is to put it over on the New York editors. We notice another recent instance that got by two sapient members of the craft, a publisher and an editor. It is a so-called poem by

Clement Wood, which *The Literary Digest* quotes with approval:

> "The tufted tussock-caterpillar
> Shoved out of his stiff cocoon.
> He did not see the blue sky,
> Nor the sun-roofed splendor of the woods.
> He looked at his dogwood branch,
> And he sighed, 'What a lot of work
> For me to accomplish!'
> And he began to eat
> And eat and eat."

Every country boy, however, knows that when the tussock caterpillar gets out of its cocoon its desire to chew dogwood leaves or any other kind of leaves has vanished. It strikes us that the poet does not know for certain whether he is going or coming, but this may be another of the peculiarities of free verse.—Ed.]

Black Walnut Wanted.—The virtue of the black walnut has been its own undoing. Because it does not readily warp or split, it is the best of all woods for airplane propellers and gunstocks, and the Government finds that the demand greatly exceeds the supply. An appeal, therefore, is being made to all owners of walnut, to assist in getting every available log to market. County agents and boy scouts are being pressed into service for locating walnut trees, and everybody interested in winning the war is urged to report the existence of available material. The logs wanted are at least twelve inches in diameter at the small end and eight or more feet long. The Government does not buy this timber but will put owners in touch with manufacturers who are using it. The price at present is about $90 a thousand feet. A tree that will square twelve inches and make a log sixteen feet long is therefore worth nearly $20. We are frequently told that certain products are scarce because of the war, and this is likely to be true of walnuts for some time to come.

Wilting of Cut Flowers.—Wild roses have generally wilted for me, even if put in water three minutes after being picked, but I have found that if I take the vase of water to the bush and put the cut roses in it immediately they keep perfectly for from three to seven days and then really fade and shatter, rather than wilt. I know poppies should be treated so, but have not found the method successful with wild elder. I should like to have a list of the flowers that must be treated so in order to be kept fresh.—*Mrs. Nellie G. Masson, Indianapolis, Ind.* [Certain physiological conditions underlie the wilting of flowers when cut. It is probably well known that there are certain small tubes in the stems of plants through which the water for their nourishment travels and, furthermore, that it is this moisture, rather than the woody parts of the leaves and flowers, that keep them expanded. Owing to the evaporation which goes on more or less rapidly all the time, the water in the tubes is under a certain tension and when the column of water is broken by the cutting of the stem, the tension draws the water into the tubes to be followed by air. When the stems are later immersed in water these tiny air bubbles interfere with the rise of additional moisture. Plants with soft and juicy stems are much less likely to wilt when treated thus, than are stems that are hard and woody. It is probably not necessary to carry the vase to the plant if the cut flowers are carried into the shade at once and about an inch of the stem cut off *under water* before being transferred to the vase. When many leaves are left on the stem with the flowers, the latter have a greater tendency to wilt on account of the leaves taking much of the moisture that would otherwise be available for the flowers. This is especially true of woody plants in which the moisture does not move as rapidly as it does in herbaceous species.—Ed.]

Kochia Alata.—In the description of *Kochia alata* on page 52 of this volume, the word, *reduced,* in the seventh line,

should be *reddened.* Mr. Bates wrote it reddened, but somebody blundered, in which case we always blame it on the printer.

PODOPHYLLUM PELTATUM POLYCARPUM. — Mr. O. M. Schantz reports that while botanizing near Willow Springs, Cook County, Illinois, last fall, he found a May-apple with eight fruits. This seems to be the record for the number of fruits on a single plant. Willow Springs is a few miles from Palos where the type specimen was found. Apparently the form is not rare in the general region.

ODOR OF AMELANCHIER. — Referring to the ill-scented form of *Amelanchier* mentioned in the May number of this magazine, Miss S. F. Sanborn writes that she has again visited the locality for the plants and finds that they belong to *Amelanchier oblongifolia.* The ill-scented form is described as having straggling flowers with petals longer and narrower than in the type and the young leaves appear to be rather more heavily covered with tomentum. The flowers do not merely have an unpleasant odor, but smell disagreeably. In a trip of some miles across the sandy plains, sometimes one and sometimes the other form was found, showing that the odor is not confined to a single clump of plants. It is quite possible that a more extended study would show characters upon which a new form should be made.

EDITORIAL

The denizens of our gardens are ordinarily regarded as exotics. We make war on the golden-rod, toad-flax, rudbeckia, daisy, and the like, because they are familiar to us in the wild state, and we cultivate many plants more lacking in beauty, simply because they are rare. The writer knows of one instance in which the purchaser of a well-planted garden pulled up all the wild phlox and columbines growing therein and planted castor beans in their stead, because the uprooted plants "used to grow in our woods." Many another admirer of a beautiful garden flower loses interest in it when he discovers that it grows wild in the locality, and yet the cultivated flowers do not form a distinct group and did not originate in any particular region. They are drawn from all parts of the world. One's own locality will be found to have yielded its full share to the collection. A contributor from Texas reports that twenty-five different species of plants from her part of the world are offered in the catalogue of a well-known nurseryman, and in the region where this note is written, there are no less than fifty-two perennial species, exclusive of shrubs and trees, which are named in the same catalogue. As a matter of fact, the showy wild flowers of any region are usually regarded as desirable garden flowers in places where they do not grow naturally. The ox-eye daisy, which in New York and New England is considered a pestiferous weed and referred to as white-weed, is, in parts of Illinois, known as the marguerite and is given an honored

place in the flower gardens. At present, only a small part of the desirable plants of the world are cultivated. Some, to be sure, are difficult to cultivate outside of the very restricted limits to which they are adapted, but many others only need a little attention to make them real acquisitions to the flower garden. These plants are slow in coming into use, however, because the dealers in plants are mostly interested in catering to a demand that already exists, rather than in stimulating an interest in new forms. This work of introduction usually devolves upon the amateur. The catalogues of nurserymen are pretty much alike. After a few years of studying them, the species offered can be named almost in their order. Our Government is doing very admirable work in stimulating interest in new things through its encouragement of exploration in many out-of-the-way places of the earth. A number of the new forms imported have been sent to the editor of this magazine for experiment, mostly to discover whether they are hardy in this climate. We have a considerable number of such forms, also, which have been received from correspondents in various parts of the United States. Many of these are likely to develop into very desirable garden forms, after they have had a short course of education in the ways of civilization.

* * *

On another page of this issue, we reprint some observations by Dr. L. H. Bailey regarding the botanical status of certain of our garden plants. As is well known, many of these are not good botanical species or varieties, but complexes whose origin is for the most part unknown and possibly undiscoverable. In appearance, however, they are like good botanical species and are usually recognizably distinct from closely related forms. They even come true from seeds in many cases. The question of their proper naming has been taken up none too soon, for their numbers are being constantly increased by horticulturist and plant breeder. At present our systems of nomenclature do

not provide for such plants. We have found means of indicating forms and varieties of single species but, as yet, we have no way of naming and indicating blends of several different species or varieties which have all the appearances of separate species. It has been suggested that in the manuals the names of such complexes might be set in different type or be given some designating symbol. The suggestion as to the use of different type does not appeal to us. It would seem that the designation should be of such nature that the status of the form would be apparent whenever and wherever the name was used. We suggest that since hybrids are indicated by x between the supposed parents, it would be quite easy to use either the plus sign after the generic name or separate the generic and "specific" names by the customary botanical sign for indefinite or many—a figure 8 on its side. This would clearly indicate the conditions.

BOOKS AND WRITERS

Certain features of evolution never fail to excite our curiosity and admiration. Although regarding the origin and development of living things as a sort of game of chance in which the best adapted is sure to win in the long run, we nevertheless find a variety of adjustments between different forms which seem more than coincidences and which suggest that some sort of determining influence runs through all the manifestations of nature. Take the case of the herb-eating mammals, for instance. The early vegetation was woody, and herbivorous species, if in existence then, would have had a hard time of it, but when the more tender herbs appeared, the herb-eating animals appeared with them. A similar condition exists with regard to insects and flowers. The first insects were wood eating species and the first

flowers were lacking in color, fragrance and nectar, but when nectar bearing flowers appeared, nectar-loving insects were there to serve them and the two have since developed together. Notwithstanding this, many cases of the mutual adaptations of flowers and insects seem a matter of foreordination, especially in those cases where the interdependence is so great that neither plant nor insect can thrive without the other. The yucca and the pronuba moth, or the fig and the *Blastophaga*, are good illustrations. In general flowers have not only become adapted to the visits of insects, but they have been specialized to such an extent that there are now bee flowers, butterfly flowers, fly flowers and various other categories each distinguished by peculiarities of shape, color and time of blooming. On the other hand there are species of bees—many of them—that frequent only a single species. When its flowers are open, its favorite bees are on the wing and when the blossoms close, that is the end of the bee's season of life until another year. One bee of this kind visits the spring beauty, another the common violet, another favors the crane's-bill and a fourth the strawberry. Nearly a quarter of the North American bees have this habit. A full account of these matters and many others relating to flowers and insects are given in a volume entitled, "The Flower and the Bee," recently issued by Charles Scribner's Sons. The author is John H. Lovell. Being both botanist and entomologist he is particularly well fitted for the task of making a book on flower pollination. The early chapters of the book give an account of the discovery of the relations of flowers and insects and others discuss the groups of flowers visited by bees, butterflies, bumblebees, hawk moths, flies, etc. There is also a discussion of the colors of North American flowers, part of which earlier appeared in this magazine, and some observations on the usefulness of bees to the fruit grower.

This book is embellished by more than 100 excellent illustrations scattered through the 278 pages of text. Books of any kind on flower pollination are rare, and this one is especially good. The price is $2.00 net.

There are two ways of studying nature. We may study the various forms with the primary object of finding out all about them, or we may confine ourselves to a study of such forms only as affect our welfare. The latter phase of the subject, often called civic biology, is nowadays often substituted in the schools for the more scientific and orderly study of nature. Textbooks for use in such studies have been issued with many different points of view, and to the list must now be added a rather superior volume entitled, "Civic Biology," by C. F. Hodge and Jean Dawson. This gives directions for the study of insects, birds, fungi, bacteria, rats, reptiles, parasites and similar forms that react upon our environment. The book bristles with quotations and questions, the latter designed rather to make the pupil think than to direct him to some answer in the book. In the opinion of the reviewer, many of the questions are rather too difficult even for the child of high school age and presuppose more information than the student is likely to possess. The book, however, has the right viewpoint and the intelligent teacher will know how to select. It is probably inevitable that in covering so wide a field some mistakes will be made, but those that occur are not of importance. In some cases the bibliography is not at all representative. There are more than 150 illustrations. The book is issued by Ginn & Co., and the price is $1.60.

The American Botanist

A Quarterly Journal of Economic & Ecological Botany

WILLARD N. CLUTE, EDITOR

SUBSCRIPTIONS.—The subscription price of this magazine is $1.25 a year or $2.00 for two years, payable strictly in advance. The magazine is not sent after subscriptions expire. Personal checks on small or distant banks must contain ten cents for collection fees. The magazine is issued on the 20th of February, May, August and November.

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THE FERN BULLETIN

In 1913, at the completion of its twentieth volume, **The Fern Bulletin** was consolidated with this magazine. The back volumes average more than 100 pages each, and since they cover the entire formative period of American Fern study they are invaluable for reference. The majority of new forms discovered in recent years have been described in its pages. First six volumes out of print. A set of vols. 7 to 20 will be sent for $8.00. An extended description of the contents of the volumes may be had for the asking.

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207 WHITLEY AVENUE, JOLIET, ILL.

ENTERED AS MAIL MATTER OF THE SECOND CLASS AT THE POST OFFICE, JOLIET, ILL.

Arctic Fleabane.—*Erigeron simplex.*

THE AMERICAN BOTANIST

VOL. XXIV. NOVEMBER 1918. No. 4.

Through the gray and sombre wood,
Against the dusk of fir and pine,
Last of their floral sisterhood
The hazel's yellow blossoms shine.
—Whittier.

THE ARCTIC FLEABANE

By Mrs. Blanche H. Soth.

MANY authorities refer these alpine daisies to *Erigeron uniflorus.* When they grow in sterile soil in exposed situations they are aptly described by the general characters of that species—"low woolly, monocephalous, five leaved; stems pedunculiform at the summit"—but when they grow in sheltered, moister places nearer timberline, they are longer stemmed, larger flowered, lose much of their woolliness and have broader leaves. This large form was called *Erigeron leucotrichus* by Dr. Rydberg in the "Flora of Colorado".

It is easy to collect every variation between the two extremes. Puzzled by my inability to separate them, I sent some specimens to Dr. Rydberg asking his opinion of them. He replied that *Erigeron uniflorus* is not found in the United States at all, perhaps not on the continent, that it is a native of Greenland, distinguished by its inrolled rays. He further said that *Erigeron leucotrichus* had been named from some abnormally large specimens of *Erigeron simplex* and that all my alpine daisies of this type were of the latter species, as that name was the proper one by reason of priority.

The alpine daisies are abundant upon all of our higher mountains from Montana to Colorado and California and are said to extend into the Arctic regions. The heads are large and very brilliant, ranging in color from blue through purple, rose, and pink to almost white. In contrast to most of the other fleabanes, they retain their color in drying and make beautiful herbarium specimens.

THE PINEAPPLE GUAVA

By Vaughan MacCaughey.

THE true guavas (*Psidium*) are widely known and enjoyed throughout tropical and sub-tropical regions, both as fresh fruit and in the form of jam, jellies, etc. Closely related to them, however, is a little-known species, the Pineapple Guava, *Feijoa Sellowiana*. This is native to sub-tropical South America, particularly western Paraguay, southern Brazil, Uruguay, and parts of Argentina. In these countries it is common in the forests and, although not cultivated by the natives, the fruit is highly prized by them. The designation pineapple guava refers to the flavor of the fruit, which strongly resembles that of the pineapple. It is also called Brazilian guava or fig guava.

It was named by Berg after material collected by Friedrich Sellow in Brazil. The genus was dedicated by Berg to Joan de Silva Feijoa (correctly pronounced fay-zho-a) director of the Museum of Natural History at San Sebastian, Brazil. The first complete and accurate description of the species was not made until forty years later, by Dr. Edouard André; in Revue Horticole 70:265, 1896. Two other species have been described,—*F. obovata* Berg and *F. Schenckiana* Kiaersk, but the fruits of both these are unknown. The genus is closely allied to *Psidium*, but distinguished from it by albuminous seeds and stamens sub-erect in the bud.

The only general account in the American literature is that of F. W. Popenoe, in the Pomona College Journal of Economic Botany, but this journal had a limited circulation and has been defunct for several years. The fruit was unknown in the Hawaiian Islands previous to 1908, and the present account is the first to emphasize its possibilities in this Territory of the United States.

The pineapple guava was introduced into southern Europe in 1890, and is grown in southern France and Italy. From Italy it was introduced into the United States in 1900. It has been widely planted in California and in 1908 the Hawaii Agricultural Experiment Station received plants from southern California. These have grown satisfactorily. The tree itself is well adapted for use as an ornamental and as a hedge-plant, and the fruit is of unusual horticultural promise. There are now on the market several named varieties, of which André, Hehre, and Besson are the best known.

The shrub attains a height of 10-15 ft. Very old plants may have a total spread of 18 ft. or more,. with trunks 8-10 inches thick at the base. The branches are rounded and swollen at the nodes. The bark is light gray; the entire plant, with the exception of the upper surfaces of the leaves and the corollas, is covered with white tomentum. The leaves are opposite, short petioled, thick and coriaceous. They resemble those of the olive, but are much larger. The upper surface is dark glossy green; the lower surface is silver gray, canescent and finely pubescent. The striking contrast in the two surfaces constitutes one of the ornamental features of the plant. The margins are slightly recurved. The veins are inconspicuous on the upper surface of the blade; below they are fine, prominent and in arcuate reticulations, re-uniting before reaching the margin of the leaf.

The flowers are showy (1-1.5 inches diameter), red, white and purple, bisexual, and solitary or in clusters. They appear

in late spring. The stamens are numerous and about 1 inch long, erect in a large cluster of many series. The filaments are showy, filiform, deep purple or crimson red. The anthers are globular and yellow. The style is longer than the stamens, filiform, and with a capitate stigma. The flower as a whole is very attractive, with plentiful nectar, pollen and aroma; a bush in full blossom is handsome to a marked degree.

It has been demonstrated that the flowers of the pineapple guava are largely self-sterile, and although isolated plants are not infrequently productive, it is good horticultural practice to plant two or more bushes together so as to permit cross-pollination. For a detailed statement of these investigations see K. A. Ryerson, in University of California Journal of Agriculture 2 (1914) no 2, pp 51-53.

The fruit is a berry, oblong or oval, 2 inches long and 1.5 inches in diameter (there is considerable variation in size), with 4 many-seeded locules. When mature, it is characterized by a delicious penetrating odor. The surface is at first tomentose, then smooth. The fruit is crowned by the thick disk and cupped sepals of the persistent calyx. The skin is much indented, slightly and unequally furrowed, but upon maturity becomes smooth. In color it is dull green sometimes flushed with crimson on one side. The green color is retained at maturity. The flesh comprises a firm, whitish, granular layer which surrounds the central pulp. This pulp is thick, creamy yellow or translucent, and melting. It possesses a delicious flavor, strongly resembling that of the fully matured pineapple, with a rich heavy bland perfume. In the pulp are 20-30 very small oblong seeds, so small as to be unnoticed in eating the fruit, and contrasting with the seedy interior of the common guava.

The fruit should not be picked until it is fully mature. It ripens in autumn and early winter, and falls to the ground upon maturity. The ripe fruit should be laid in a cool place until

ready for eating. Little care is required in packing; the fruit is an excellent shipper if it is kept cool. It quickly spoils in a hot, humid atmosphere, but can be kept for a month or more if suitable conditions are maintained. The fruit is not only delicious when eaten out of hand, but also can be cooked, crystallized, and made into jams or jellies.

A notable feature of the pineapple guava is that it grows better under sub-tropic conditions than in strictly tropical regions. It is hardier than most of the fruits found in the Hawaiian Islands, such as the mango, avocado, papaia, etc. The best climate for it seems to be one free from excessive moisture and cool for at least a portion of the year. In France it has passed uninjured through temperatures of 12° F. It would probably thrive in the upland regions of Maui and Hawaii, as well as on cool parts of the Kauai and Oahu lowlands. The plant is notably drought resistant, and contrasts strongly in this respect with many other tropical fruits. It requires very little pruning or other attention.

Propagation is usually by seed, which comes fairly true. The seedlings come into bearing in 3-5 years. Cuttings of the young wood are successfully rooted under glass, with bottom heat, although they root very slowly. Layering is used in France and other parts of southern Europe to propagate choice varieties. The layers root in about six months.

The pineapple guava offers very attractive possibilities to all who are interested in tropical and sub-tropical horticulture. There is no question but that in time it will make for itself a large and unduplicated place in the horticulture of the Hawaiian Islands, southern California, and tropical Florida.

SOME OREGON EXOTICS

By J. C. Nelson.

ON June 2, 1917, Mr. M. W. Gorman and the writer made an excursion to the steep wooded cliff known as Elk Rock, on the left bank of the Willamette about seven miles south of Portland, Oregon. Our primary object was to look for the very local *Poa alcea* at the station where it was first reported by C. V. Piper; and in this we were successful, as the *Poa* was abundant near the base of the rock below the level of the railroad trestle. But our exploration of the rock revealed another plant that to our knowledge has not been before reported from the West. A winding path leads up the rock from the suburban station at the base to the beautiful estate of Mr. Peter Kerr on the summit. Forcing our way through the dense shrubbery bordering this path, we found the wet shaded rocks covered with vegetation. Along with *Saxifraga Mertensiana* and *S. Nuttallii* we soon observed in abundance another yellow-flowered *Saxifraga* that was wholly unfamiliar, and which we were unable to determine. It had every appearance of being a native, and it did not occur to either of us to surmise that it might be introduced. Had we found it along the margin of the path, where some rock-loving species had at an earlier date been transplanted, we might have guessed it to be exotic; but it seemed to prefer more remote situations, and was nowhere associated with introduced species until the summit of the rock was reached. Here we found in the spacious grounds about the residence a beautifully laid-out rock-garden, through which we were shown by the courteous and intelligent English gardener; and

here we again encountered our yellow saxifrage along the border of the paths and clinging to the rock-work. In answer to our inquiries, the gardener assured us that it had never been cultivated, and he had always regarded it in the light of a weed; but he was not aware of the extent to which it had invaded the thickets below.

On sending a specimen to the Gray Herbarium, it was determined by Mr. J. Francis Macbride as *Saxifraga Sibthorpii* Boiss—a native of Greece, and not previously reported in this country as an escape. Future collectors on Elk Rock will doubtless encounter it and take it at first sight for a native species, so thoroughly has it adapted itself to the local environment.

Another plant which we found only on the border of the rock-garden, and which the gardener informed us had also never been cultivated, was *Corydalis lutea*. Along with this was a very small cruciferous plant with orbicular leaves and tiny white flowers, the whole plant only a few centimeters in height, which seemed to prefer the shaded soil under the larger plants and against which the gardeners were waging a vigorous campaign. The pods were hardly mature, but on a second visit in July I found them well-developed. It appears to belong to *Cardamine*, but all efforts to determine the species have thus far been fruitless. I am hoping that it may survive the war of extermination and that another season may enable us to identify this interesting immigrant.

Another illustration of the ease with which foreign species become established in Western Oregon was afforded in the course of a collecting trip taken in June, 1917, by Professor M. E. Peck of Willamette University and the writer along the Rogue River canyon in southwestern Oregon. On our second day out from the railroad, in one of the most thinly-settled and inaccessible sections of the State, where for a distance of forty miles no wheeled vehicle had ever pen-

etrated, and where navigation was impossible on account of the dangerous rapids, we began to observe on sandbars along the river, in open ground about the few ranch-houses, saw-mills and mining camps, and in pastures where all other vegetation had been cropped close, large quantities of the stately *Euphorbia Lathyrus.* This is known as "caper spurge" or "mole-plant", and is occasionally planted in old gardens as a fancied protection against moles. It sometimes persists for a year or two, but scarcely to be regarded as naturalized in the settled parts of Oregon. Yet in this wild and remote canyon it had fully established itself and would have been taken by the casual observer as one of the commonest native plants.

We continued on down Rogue River to a point about thirty miles from the mouth, and found the *Euphorbia* still common. For a distance of some ten miles along the river it seems to be one of the dominant species; yet we nowhere found it in cultivation or closely associated with cultivated plants, and none of the inhabitants—mostly Indians—appeared to know its name or properties.

Two other introduced species that were almost equally common along this part of the canyon, but less conspicuous, were *Silene gallica* and *Chenopodium carinatum,* both of which must have been introduced as weeds, since they possess no qualifications either as useful or ornamental plants that would justify their cultivation. Oddly enough I have never seen either of these species in the more thickly-settled areas of Oregon.

One of the most interesting grasses that has recently appeared in Western Oregon was collected on ballast at Linnton, near Portland, during the season of 1915 and 1916, but, on account of the appropriation of the area by a new ship-yard, has probably been exterminated. The grass in question was determined by Mrs. Agnes Chase as *Stipa littoralis* Philippi, and there are no specimens in the National

Herbarium except those collected by Philippi himself at the original place of discovery—the island of Quiriquina on the coast of Chile. This is probably its first appearance at any station in the United States.

Another interesting grass immigrant, also determined by Mrs. Chase, appeared in great abundance about some old brick buildings in the business district of Salem, Oregon, in the early summer of 1917, although no record of its previous occurrence in this State seems to exist. This is *Scleropoa rigida* Griseb—a grass of Southern Europe whose occurrence in the United States seems to have been previously confined to ballast-grounds about the Southern and Eastern ports. How it arrived at a point so far inland as Salem can only be conjectured. So far as I can discover, the owners of the adjacent buildings have not been in the habit of receiving or storing foreign goods. A zealous street-commissioner mowed down the entire crop after it had matured; but we are hoping that it will reappear next season.

THE PURPLE WATER AVENS

By Lucina Haynes Lombard.

CONSPICUOUS among the denizens of lowland runs is the graceful purple avens (*Geum rivale*), whose creeping root-stock, of a pinkish chocolate brown, curiously scarred, interlaces the ground like the rhizomes of witch grass, so thickly do the plants grow. The root-stocks were steeped by the early settlers and when the decoction was sweetened and creamed, it was said to be better than chocolate, having the wild tang of the free open about it and being withal a pleasant and bracing drink. This wild chocolate, as the settlers called

it, was in high favor with colonial dames in the period of the Boston Tea Party.

The plant's season of growth is in itself peculiar, its roots lengthening very perceptibly during the late fall and early winter. This makes it much better to dig them in the spring than in the fall. In digging, the gatherer must don rubber boots, for the runs are plashy and often one would be more than ankle deep in the icy water. The cushion of sphagnum moss about the base of the plants is easily dug away with the garden trowel and the crisp roots broken off. The root leaves of the purple avens are thick and deeply parted, with rounded lobes. The tough, hairy, branching stems grow to a height of two feet and their few leaves are three parted.

In June the large purplish-brown and yellow-blotched flowers are borne in loose racemes nodding and bell-like. The position of the flowers like that of the hare-bell of our river banks, protects its pollen and nectar from the rains and heavy dews. The blossoms close at night and droop their sleepy heads still lower. As in other members of the rose family, the claw-like petals drop early, leaving a fuzzy seed ball. The flowers welcome practically all the flying insects that care for nectar or pollen.

"O, who can tell
The hidden power of herbes, and might of magic spell!"

sang Spencer in his *Faerie Queen*. Even down to our own prosaic day the interest in the purple avens centers not a little in the supernatural powers which are attributed to it. According to popular belief, friends provided with the leaves are able to converse though many miles apart and speaking in the faintest whispers.

The wandering Romany bands are said to hold this plant in high repute, for no sooner does a gypsy wife decide to go fortune telling to a near-by town than she takes some of the coarsely ground root and, steeping it, decides from the appear-

ance of the fateful cup, whether a lucky or unlucky day awaits her. Whether this comes from pure superstition or from the magic of Romany intuition, the uninitiated do not pretend to say, but to this belief the gypsies have held for centuries.

FIRST APPLE TREE OF THE NORTH-WEST

By H. E. Zimmerman.

IN the Vancouver Barracks, State of Washington, there stands an apple tree of more than ordinary importance. Its history is so interesting that Bancroft, the noted historian, says in regard to it: "At a lunch party in London, about 1825, given in honor of some young gentlemen who were about to embark for Fort Vancouver, in the employ of the Hudson Bay Company, seeds of the fruit eaten were slyly slipped by some young ladies into the waistcoat pockets of the young men, and upon their arrival at their destination, the young men, in overhauling their wardrobes, discovered the seeds and gave them to Bruce, the gardener, at the Fort." Mrs. Mary Whitman, wife of Marcus Whitman, also wrote an interesting history of this tree, Sept. 12, 1836.

It is said that the seeds planted by the gardener, Bruce, produced several trees, three of which lived for a long time, and were pointed out as the only apple trees in the northwest. In the course of time two of them disappeared. The existence of a third tree seems to have been almost entirely forgotten by the general public, not even the commander of the barracks knowing that such a tree stood on the very ground which he controlled. It was largely through the horticultural inspector of this district, A. A. Quarnberg, that the tree was discovered and identified. In 1911 Mr. Quarnberg wished to have a gavel made of wood from this apple tree for the Washington State

Horticultural Association, and, upon examining it, found it badly infested with San Jose scale, half its branches dead, and in a bad condition generally. In January of that year he called upon Col. G. K. McGunnigle, Commander of the Barracks, and got the necessary permit to prune, spray, and do anything necessary to preserve the life of the tree. By direction of the Washington State Commissioner of Horticulture, he took measurements and found the tree to have the following dimensions: One foot from the ground, 1½ feet in diameter; height 33 feet, and spread of crown 33 feet. In February the tree was pruned, and all dead branches and brush removed, the rotten wood in the trunk and branches cleaned out and filled with cement, and all cuts painted. Later it was sprayed and a good coat of manure applied at its roots. The tree is evidently a yellow bell flower seedling. In 1915 the Department of Agriculture at Washington requested Mr. Quarnberg to send them specimen apples for making wax forms.

ROCKY MOUNTAIN FOOD PLANTS

By Mrs. Blanche H. Soth.

AGROPYRUM spp. Wheat Grass. Most of the species of wheat grass have starchy grains. Stock and poultry thrive upon it and it could doubtless be utilized as a cereal food.

Allium Schoenoprasum. Purple Garlic. Chives. The young tips are used as a flavoring for meats in salads, etc.

Calochortus Nuttallii. Sego Lily. The sweet, mushy bulbs were used by the Indians and the Mormon pioneers for food. Dried and pulverized they could be preserved and used like arrow-root.

Oxyria digyna. MOUNTAIN SORREL. An Arctic-alpine species. The root-stocks and leaves are eaten by the natives of the Far North.

Atriplex spp. SALT BUSH. PIGWEED. Several species of *Atriplex* are useful as pot-herbs.

Berberis repens. OREGON GRAPE. The ripe berries are unsurpassed for jelly making.

Rhodiola rosea. ROSE-ROOT. KING'S CROWN. Another Arctic-alpine plant. The fragrant root-stocks are eaten by natives of the Arctic regions.

Psoralea esculenta. POME BLANCHE. The turnip-shaped, mealy, farinaceous roots are edible and said to be a good substitute for potatoes.

Chamaenerion latifolium. WILLOW-HERB. The roots and young shoots are eaten by natives of Northern Greenland.

Valeriana edulis. VALERIAN. The large, spindle-shaped roots are eaten by the Indians.

Balsamorrhiza sagittata. ARROW-LEAF. The thick fragrant roots are eaten by the Indians.

Artemisia spp. SAGE. The leaves were used to brew the famous sage tea, a pioneer cure-all. Several species are reputed to possess medicinal value. *Artemisia frigida,* the Rocky Mountain sage, and *A. tridentata,* the black sage or sage brush, are oftenest used. *A. frigida* is sold as "Mountain Sage."

GERMINATION OF WILD CUCUMBER SEED

By J. Ford Sempers.

WHEN do wild cucumber seeds germinate? By that I mean when is the normal time of germination? For some years past I have been getting such surprising results under conditions that were anything but normal that I have wondered what really are the natural habits of the plant when not meddled with.

We do not have the wild cucumber (*Echinocystis lobata*) in a wild state here that I know of. Occasionally they are seen planted as an ornament and are sometimes attacked by the wilting blight, a scourge that often plays havoc with cultivated cucurbits. As a rule the seed that I have experimented with has been old and the seed coats consequently have been very hard and impervious to moisture. Therefore unless the seeds were clipped—that is, a small part of the seed coats removed by filing, or unless subjected to freezing, very few could be induced to sprout at all.

It did not occur to me at first that frost could be considered in connection with the germinating of a cucurbit. Yet I should have remembered that young plants of the watermelon and squash have occasionally appeared the following year on land occupied by such crops the previous season. I was reminded of this, however, in an unusual way. It was my habit to throw in a pile the refuse of seed tests, which consisted of the sand used in making the tests together with the seeds that failed to germinate and the seed coats of those that did. The piles frequently remained undisturbed a year or more before being removed.

Along in the middle of December in passing one of these sand piles of the preceding winter I noticed a furrow had been cut through it by a recent warm rain. On one side of the wash were several well germinated cucurbits which I first supposed were gourds but in examining the seeds coats still attached to the cotyledons I found them to be the wild cucumber seeds of the previous winter's testing. This was surprising as the sand pile had been frozen through in the early part of the month. On the 19th of April, following, two of the plants pushed through the surface and later developed into sturdy vines. As the season advanced the blossoms appeared and in due time the fruit matured. These two plants therefore with the protection of but a few inches of sand, which I replaced when washed away, withstood the frequent freezings of the following winter months in a fully germinated condition. Of those who know the plant in its native haunts I would like to ask, do the seeds germinate in very early spring or possibly in late winter?

[The plant mentioned by Mr. Sempers, is fairly common in many parts of the North Central and Middle States and in a large part of its range the temperature often goes down several degrees below zero every winter. We have found by experiment that it is very difficult to start new plants from seeds kept at ordinary room temperatures over winter, but if the seeds are sown in autumn they germinate very readily in spring. The plants being sensitive to frost, do not appear until danger from frost is past, but the seeds appear much more resistant. We had supposed that failure to grow in the case of seeds kept in the house was due to their being killed by drying, but it is possible the seed-coats are impervious to either oxygen or water and need a period in the soil during which the coats disintegrate. Here is a problem still to be solved.—Ed.]

OILS, RESINS AND RUBBERS

(Concluded.)

ESSENTIAL OILS.

Citrus aurantium. OIL OF ORANGE. Obtained from the flowers. Southern France, Sicily.

Citrus aurantium. OIL OF NEROLI. From the flowers. Southern France, Spain.

Citrus aurantium var. *bergamia.* BERGAMOT OIL. From the rind of the green fruit. Tropics.

Citrus aurantium bigaradia. OIL OF PETTIGRAIN. From the young leaves and twigs of the bitter orange. Paraguay, Southern France.

Citrus medica var. *limonum.* OIL OF LEMON. From the rind of the fruit. Sicily, Southern France.

Citrus medica var. *acida.* OIL OF LIMES. Said to be distilled from lime juice. West Indies.

Illicium verum. OIL OF JAPANESE STAR ANISE. Oil obtained from the fruit. China.

Pimpinella anisetum. OIL OF ANISEED. From the fruits. Germany, Russia.

Eugenia caryophyllata. OIL OF CLOVES. Oil distilled from the unopened flower buds, and from the leaves and wood. That from the flower buds valued the highest. East Indies.

Dicypellium caryophyllatum. CLOVE BARK OIL. From the wood and bark. British and French Guiana.

Prunus amygdalus var. *amara.* OIL OF BITTER ALMONDS. From the seeds. Oil from the kernels of apricot seeds is used as a substitute. Southern France.

Betula alba. OIL OF BIRCH. From the bark. Source of the European product. Northern Europe.

Betula lenta. Oil of Birch. From the bark. This species with some *Betula lutea* the source of the American supply.

Melaleuca laucadendron. Cajput Oil. From the leaves. East Indies, Celebes.

Pimenta acris. Oil of Bay. Distilled from the dry leaves. West Indies.

Carum copticum. Ajowan Oil. From the fruits. India, Egypt. This is a source of thymol.

Carum carvi. Caraway Oil. From the seeds. Central Europe, India.

Cananga odorata. Ylang-Ylang Oil, Cananga Oil. The first distilled from the fresh flowers, the second from the dried flowers of the same tree. East Indies, Madagascar.

Cinnamomum camphora. Camphor Oil, Laurel Camphor Oil. From the wood and sometimes the leaves. Celon, China, Japan.

Dryobalanops aromatica. Borneo Camphor Oil, Sumatra Camphor Oil. From the wood. Malay States.

Cinnamomum Zeylanicum. Cinnamon Oil. From both bark and leaves. Ceylon.

Andropogon schoenanthus. Ginger Grass Oil. From the leaves. India.

Andropogon nardus. Citronella Oil. From the leaves. East Indies.

Eucalyptus spp. Eucalyptus Oil. From the fresh leaves of several different species, notably the blue gum (*E. globulus*) peppermint tree (*E. amygdalina*) and lemon-scented gum (*E. citriodora*). Australia.

Pelargonium spp. Oil of Geranium. From the leaves of various species. France, Spain, Algeria.

Lavendula vera. Oil of Lavender. From the leaves. England, Southern France.

Lavendula spica. SPIKE OIL, LAVENDER SPIKE OIL. From the leaves. Regarded as inferior to the preceding. Spain, Southern France.

Rosa spp. OTTO OF ROSE. From the petals. Bulgaria. Persia, Southern France.

Pogostemon cablin. PATCHOULI OIL. From the leaves. India.

Mentha piperita. PEPPERMINT OIL. From the leaves and stems. France, Germany, United States.

Mentha arvensis. JAPANESE PEPPERMINT OIL. Like the preceding. Japan.

Pinus spp. PINE OIL. From the leaves. A similar oil is obtained from the leaves of species of *Abies, Larix* and *Picea.*

Santalum album. SANDALWOOD OIL. From the wood. India.

Sassafras variifolium. OIL OF SASSAFRAS. From the bark of the root. United States.

Gaultheria procumbens. OIL OF WINTERGREEN. From the leaves. United States.

Pimenta officinalis. OIL OF ALLSPICE. From the seeds. Tropics.

Chenopodium anthelminticum. OIL OF CHENOPODIUM. From the leaves and stems. United States.

Copaifera Langsdorffi. OIL OF COPAIBA. Tropics.

Coriandrum sativum. OIL OF CORIANDER. From the seeds.

Piper cubeba. OIL OF CUBEBS. From the seeds. Tropics.

Foeniculum capillaceum. OIL OF FENNEL. From the seeds.

Hedeoma pulegioides. OIL OF PENNYROYAL. From the leaves. United States.

Sinapis nigra. OIL OF MUSTARD. From the seeds.

Myristica fragrans. OIL OF NUTMEG. From the seeds. Tropics.

Rosmarinus officinalis. OIL OF ROSEMARY. From the leaves.

Mentha viridis. OIL OF SPEARMINT. From the leaves.

Thymus vulgaris. OIL OF THYME. From the leaves.

GUMS AND RESINS.

Acacia Arabica. GUM ARABIC. Northern Africa. India.

Acacia Senegal. SENEGAL GUM. Senegal.

Astragalus gummifer. GUM TRAGACANTH. Greece, Asia Minor, Persia. This gum is yielded by many other species of *Astragalus.*

Ferula narthex. TIBETAN ASAFOETIDA. Kashmir.

Ferula foetida. PERSIAN ASAFOETIDA. Northern Afghanistan.

Commiphora spp. MYRRH. Arabia.

Commiphora mukal. INDIAN BDELIUM. India.

Commiphora Africanum. AFRICAN BDELIUM.

Pinus spp. RESIN OR ROSIN. Northern Hemisphere.

Agathis australis. GUM KAURI. New Zealand.

Xanthorrhoea spp. GRASS TREE GUM. Australia.

Guaiacum officinale. GUAIACUM. Tropical America.

Pistacia lentiscus. MASTIC. Greek Archipelago.

Canarium Luzonicum. GUM ELEMI. Philippines.

Styrax Benzoin. BENZOIN. Sumatra.

Vateria Indica. INDIAN COPAL. South India.

Agathis loranthifolia. DAMAR. Burmah.

Trachylobium Hornemannianum. ZANZIBAR COPAL. Zanzibar.

Copaifer Gorskiana. INHAMBANE COPAL. Mozambique.

Copaifer Guilbourtiana. SIERRA LEONE COPAL.

Daniellia ogea. OGEA. Southern Nigeria.

Dorema ammoniacum. GUM AMMONIACUM. Persia, Afghanistan.

Mimusops globosa. CHICLE. Central America. The basis of most chewing gums.

LAC, SHELLAC. Produced by the lac insect (*Tachardia lacca*) which feeds upon a variety of plants in the warmer parts of Asia.

RUBBER AND GUTTA PERCHA.

Hevea Brasilensis. PARA RUBBER. Brazil, East Indies.

Manihot Glazovii. CEARA RUBBER. Brazil, East Africa.

Ficus elastica. ASSAM RUBBER. East Indies.

Funtumia elastica. WEST AFRICAN TREE RUBBER.

Landolphia spp. AFRICAN VINE RUBBER. Tropical Africa.

Castilloa elastica. CENTRAL AMERICAN RUBBER.

Ficus Vogelii. ABBA RUBBER. West Africa.

Hancornia speciosa. MANGABEIRA RUBBER. Brazil.

Sapium spp. COLUMBIAN RUBBER. Northwestern South America.

Parthenium argentatum. GUYALE. Mexico.

Palaquium Gutta. GUTTA PERCHA. East Indies.

Dyera costulata. PONTIANAK GUTTA. Borneo.

NOTE *and* COMMENT

Fragrant Wildflowers.—A new angle in the fragrant wildflower situation has been developed by a note from Dr. A. F. Blakeslee in *Science*. He found two forms of garden verbena, one of which was fragrant to him and one of which was not. Happening to call the attention of an assistant to the flowers, the latter reported the odorless one fragrant and the fragrant one without odor, so far as he was concerned. This led to further experiment with the result that out of a considerable number of people tested, some found one form fragrant and some the other. The subjects were tested blindfolded so that no color suggestion vitiated the results. If this condition is found to exist with regard to other flowers, we may have to have new tests to decide which flowers are fragrant and which are not. We have repeatedly suggested that all flowers may be fragrant to the insects that visit them and here, at least, we have evidence that even fragrant flowers may be odorless to noses that can distinguish fragrance in other forms. It is likely that those who can smell at all would not disagree in the case of such strongly scented flowers as pink azalea, wild crab, wild grape, and arbutus, but in flowers reputed to be only faintly fragrant, the question now arises, are they fragrant, or is our own nose at fault? Some such condition as this may account for the reported fragrance in many species commonly regarded as odorless.

A Fragrant Goldenrod.—The specific name of one of the goldenrods—*Solidago odora*—indicates that it is odorous, but in this case the odor refers to the leaves and not the flowers.

In passing through an extended colony of the narrow-leaved goldenrod (*Solidago graminifolia*) recently, a faint, but nevertheless persistent sweet odor was noticed. When a small bunch was gathered, the fragrance was very noticeable. The species, therefore, should be added to the list of fragrant flowers. Mr. C. L. Gruber also reports this as fragrant in Pennsylvania.

New Use for Sphagnum.—The sphagnum moss, so abundant in peat bogs the whole world around, has a variety of uses. Nurseymen employ it almost exclusively in wrapping plants for transportation, its porous nature enabling it to hold moisture for a long time and so keeping the roots fresh. In places where it is not exposed to moisture, it is often used as an insulator and the Germans mix it with wool to form a rough sort of cloth. Its absorbent nature makes it an ideal bedding material for stock and this quality has recently brought it into use as a surgical dressing. The difficulty of securing sufficient cotton has made it especially desirable. Although there are more than forty species of sphagnum, only four species, *Spaghnum imbricatum, S. plaustre, S. papillosum* and *S. Magillanicum,* are at present used. Absorbent cotton will hold only four or five times its weight of water but the sphagnums will hold nearly twenty times their weight. The British War Office recently ordered 20,000,000 spaghnum pads and our own government has given large orders for this kind of surgical dressing. The spaghnum pads are composed of a layer of spaghnum backed by a layer of ordinary cotton and enclosed in thin gauze.

Peach Pits and the War.—Some people may be wondering how peach pits and the shells of nuts are any better for making charcoal for gas masks than ordinary wood. The answer is in part that the harder parts of plants, such as the shells of nuts, are not made of ordinary wood cells, but of still harder cells called stone cells. Cells of this kind are often encountered in pears as gritty particles. For some reason the charcoal made from stone cells will absorb a much larger amount of gas than

will wood charcoal—often several times as much. In fact, if a quantity of charcoal from nut-shells is exposed to gas in a closed vessel, it will absorb the gas so completely as to make a more perfect vacuum that can be made with the best vacuum pump.

VITIS PALMATA.—The red or cat grape (*Vitis palmata*) has leaves with three lobes and its stems and tendrils are a beautiful red. The sour curling tendrils twine around the nearby trees and shrubs pulling the vine up and fairly smothering the host beneath. Each new branch grows a surprising length every spring. Wild grape flowers are short lived. The corolla is a little green cap which is pushed up and off the plant at the moment of flowering. Often the base spreads when leaving and five or six petals are revealed. Sometimes five and sometimes six stamens with spreading, white, threadlike filaments are inside. The pistil is a mere dot of yellow in the center of the tiny floret at the tip of a delicate pedicel. As many as sixteen of these florets may be crowded into one cluster on the rich red stem; a dozen of these miniature clusters make up one bunch of grape blossoms—a fuzzy, greenish, fragrant bunch. One often smells before seeing them. The perfume is evanescent: one moment you perceive it and the next moment it is gone; it is much more agreeable when you are a short distance from it.—*Nell McMurray, Clearfield, Pa.*

SEEDS WANTED.—We are informed by the Naperville Nurseries, Naperville, Ill., that they are in the market, practically every year, for seeds of a considerable number of hardy plants among which are sassafras, black haw, black locust, buttonwood, scarlet oak, shingle oak, service berry (*Amelanchier*), buffalo berry, silver berry, euonymus or wahoo, fragrant sumach, prairie rose, dewberry, black raspberry, alder, red bud, coffee tree, and white fringe. Probably only northern grown seeds would be desirable, but if any collector is interested, he might communicate with the company. It might be added in

this connection, that there is a steady market for a very large number of roots, barks, leaves, flowers, and seeds native to this country, and in a few cases the price runs up to several dollars a pound. In general, however, the price is so low that only children can afford to engage in the collection as a business, though some may prove profitable as side lines for farmers and others. When the same plants can be obtained from foreign sources, the price is practically always lower than anyone would collect them for in this country.

Price of Sumach Leaves.—Three species of sumach, *Rhus copallina, R. glabra* and *R. hirta*, have leaves with enough tannin in them to make them valuable as tanning materials. The leaves and young stems are gathered and dried and sent to market in bags or in wagon-loads like hay. An active man is reported to be able to collect as much as 600 pounds of dried sumach in a day which sells for about one cent a pound dried, but the amount usually collected in a day is much smaller. The Sicilian sumach sold in this country brings from 2½ to 4 cents a pound and since our species yield fully as much tannin, the price is likely to rise when correct methods of gathering and curing are known. Since sumach grows wild in almost every locality, here is a chance for children and others with spare time to turn it into cash. For the names of dealers, collectors are advised to write their State Agricultural Experiment Stations.

Death of Raynal Dodge.—We record with regret, the death on October 20th, of Raynal Dodge, well known for his studies of the pteridophytes and author of "The Ferns and Fern Allies of New England." With A. A. Eaton he did much to make the New England species of *Isoetes* known to science and his name is commemorated in *Isoetes Dodgei*. Mr. Dodge was a veteran of the civil war. He was born in Newburyport, Mass., Sept. 9, 1844, and lived all his life in that city, where he was recognized as an authority in natural history.

Geitonogamy and Xenogamy.—Usually we distinguish two general methods of pollination in flowers which we differentiate as self or close pollination and cross pollination. There is, however, some uncertainty as to exactly what these terms mean. Take self pollination, for instance. Is this merely a transfer of pollen from the stamens to the stigmas in the same flower, or does this term cover the transfer of pollen from flower to flower on the same plant? Species are multiplied in two ways, vegetatively and by seeds. Individuals that are produced vegetatively are essentially parts of a single plant. Is the transfer of pollen from one concord grape vine to another or one Jonathan apple to another self pollination? These plants are multiplied vegetatively. Orchid pollen may be carried half way around the earth and still be effective. Is pollination of this kind self pollination? Such complications have been recognized in part by botanists and several terms have been formed for more definitely indicating different phases. Thus *autogamy* is what would ordinarily be called self or close pollination—the transfer of pollen from stamen to stigma in the same flower. *Geitonogamy* is the term used to describe the transfer of pollen between different flowers on the same plant, but a distinction is rarely made between this phase and the transfer of pollen between plants of the same species, whether such species are derived from some original species by cuttings or seeds. Plants from seeds, however, may be quite different from plants made from cuttings, since in one case the seeds may have been produced by cross-pollinated flowers and thus have united in their structures two lines of descent. Some students would call any transfer of pollen between two plants cross pollination or *Xenogamy,* but if this term denotes a cross between two plants of the same species, what shall we call a cross between two different varieties, not to mention crosses between two different species or, in rare cases, between species of two different genera? Botanists are not

agreed as to where to draw the line in such matters. In the earlier sense cross pollination or xenogamy meant the transfer of pollen from the flowers of one plant to the stigmas of another. It was in this sense that Darwin and other early botanists used the term. It is modern practice which has injected the idea that different species of varieties are necessary to cross pollination. This is due very likely to the extension of the meaning of a cross in plant breeding. A sensible rule would be to regard any transfer of pollen from one plant to another as cross pollination, making if necessary a distinction between the crossing of vegetatively produced plants, between plants of the same species produced from seeds, and between different varieties, species, or members, of different genera. Many of these phases have no names, but this defect will doubtless be remedied by the name tinkers, now that the matter has been called to their attention.

Origin of the Dicots.—It is possibly due to the usual arrangement of the species in the Manuals, that the idea prevails that the dicots originated from monocots and the latter from the conifers or Gymnosperms. A better understanding of the ancient floras as indicated by their remains in the rocks has shown that the dicots are by no means as recent as we sometimes suppose. It now appears that even in very ancient times there were numerous representatives of the magnolias, barberries, willows, beeches, figs, laurels and myrtles in the world. Moreover, since most of our fossils are by the nature of the case wet ground forms, it seems likely that an immense number of land forms may have perished and left no sign. The family line of the dicots, therefore, runs back to remote ages and instead of joining that of the conifers rather parallels it. The monocots, once thought to be older than the dicots, now appear to be a somewhat modern branch of the latter. It is highly significant that the dicots which in point of structure most resemble the monocots are those same families of

plants which are regarded as among the early dicots. The water lily until recently considered a member of the dicots in good standing is now placed by some with the monocots. It may be recalled, too, that several of the grasses have the remains of a second cotyledon.

Death of Charles K. Dodge.—Michigan botany lost a devoted student in the death of Charles K. Dodge at Port Huron, Michigan, March 22, 1918. Mr. Dodge was born April 26, 1844, in Blackman Township, Jackson County, Michigan, and lived all his life in that State with the exception of two years spent in the West and South. He was in turn, school teacher, lawyer and United States Customs officer holding the latter position till his death. His chief publications were lists of the plants of northern Michigan and Lambton County, Ontario.

Age of Endemic Species.—In many parts of the world one comes upon plants that have an extremely limited range. They may, perhaps, be confined to a single mountain range, a river valley, or an island. Usually botanists have considered such species, to which the term endemic is applied, to be the relics of species which once had a much wider distribution. Under this supposition, they would be considered to be the oldest species in the flora. There are, to be sure, species that are properly considered relics of a wider distribution, such as the Hart's-tongue fern (*Scolopendrium*), which is common in Europe but found in only one or two places in North America. Endemic species, however, always occur in a single region. The idea that they are among the oldest species has been recently challenged by J. C. Willis, who by means of his "age and area hypothesis," attempts to show that they are the very youngest. According to Willis, in any group of twenty closely related species, those that are most widely distributed show by this fact that they are the oldest and have had time to thus extend their ranges. He suggests that when a genus has a

range as wide as its family, that it is probably the parent of the rest of the family. The smaller the area over which a species is distributed the younger the species and, if it has not had time to spread far and wide, it is naturally endemic. In general the world over, the most widespread species are the oldest in comparison with the other species in the group to which they belong. The methods which plants have adopted for the spread of the species, however, has something to do with the case. The dandelion would naturally spread faster than the hickory-nut or the osage orange. The hypothesis, however, will be of use if even in a general way it indicates the differences in age of different plant groups, since this will throw more light upon their evolution.

Soil and the Plant Covering.—Exactly how much the character of the vegetation in a given locality depends upon the soil in which it grows is rarely realized by the casual observer. We know, from repeated experience, that like regions are pretty certain to contain the same kind of plants, but we fail to appreciate the fact that this is due to the soil. The difference in vegetation is especially noticeable when two very different soils happen to adjoin one another, as in the sand dune region about Lake Michigan. In the drift soils bordering the sand dunes, the common spring flowers are hepatica, bloodroot, adder's-tongue, trillium, phlox, Dutchman's breeches, squirrel corn, and the common blue violet, while on the sand dunes none of these occur. In their places we find the birdfoot violet, rock cress, bluet, huckleberry, sassafras, lupine, and large puccoon. None of these are to be found in large areas of the drift soils. In the rich black soils of swampy tracts in either region, however, there is much less difference between the plants because such soils are essentially alike. In the swamps we find cowslips, skunk's cabbage, painted cup, swamp saxifrage, white violet, squaw weed and similar species.

Chufa and Nut Grass Different.—Permit me to call attention to a mis-statement on page 134 of the November, 1917, issue. *Cyperus rotundus* is the true nut grass and is never called chufa by people familiar with the plant. The nuts are not "very sweet and edible"; on the contrary they are very bitter and vile to the taste. Since the plant is one of the very worst, if not the worst, of Southern weeds, it is probably cultivated about as much as Canada thistle is in the North. What you say for *rotundus* is true for the following species, *C. esculentus,* which is the true chufa of the South, and is occasionally found in the North. Though a bad weed in some sections, its tubers are sweet and edible, especially when roasted like peanuts. The plant has a limited use as hog food. I studied both of these plants last summer and found a good deal of confusion in botanical literature concerning them; a confusion which should be straightened out.—*Albert A. Hansen, Washington, D. C.*

Mushroom Poisons.—The diffusion of mycological knowledge has pretty well disposed of the old idea that there is one mushroom and a large number of toadstools. As a matter of fact there are a large number of mushrooms—hundreds of them—some poisonous and some edible. The poisonous ones may be called toadstools if desired, but they do not differ in any particular from mushrooms and, in some cases, harmless and harmful species are found in the same genus. It is also becoming known that the poison in mushrooms is of various kinds, some easily overcome by antidotes and some almost unaffected by any that we know of at present. One of these, found in *Gyromitra esculenta,* is a destroyer of the red blood corpuscles, another found in a large number of species is a disturber of digestion. This latter may be removed from suspected specimens by boiling for a few minutes in vinegar and water. A third group of poisons attack both the digestive and nervous systems. Several of the *Amanitas* have this poison, which is soluble and may be removed from the mush-

rooms by five minutes' boiling. The most important poison is that found in *Amanita phalloides* and its allies, belonging to the genus *Amanita*. This poison causes the destruction of certain cells of the body and does not begin to be noticeable until a long time after the mushrooms have been eaten. At present there is no known means of removing this poison, and one who mistakes these for edible species invariably dies. The poisons of the other groups often cause considerable distress, but rarely cause death in healthy individuals. Finally it may be remembered that there is no "test" by means of which the edible and poisonous species may be distinguished. The harmless kinds cannot be selected because they have an agreeable taste, or because the cap "peels," or because they do not curdle milk, or because they do not discolor silver when boiled with it, or because they do not turn color when broken. The only way to be sure is to know and recognize the species botanically.

Toxylon in Nomenclature.—Anybody looking for trouble should tackle botanical nomenclature. The name-tinkers are a superstitious lot and more scrupulous in observing dates than any banker, broker or loan shark. They are also great sticklers for precedence and if a species is mentioned twice on the same page by different names, they insist upon the first, though the last is the one in common use. One has to know all the rules of the game to be a conspicuous success and even then the most skillful player may sometimes slip and give his antagonist a chance to occupy his first line trenches. Something like this happened in the August issue of this magazine when Prof. Nelson attributed the genus *Toxylon* to Sargent. Dr. L. E. Everard of the United States Forest Service writes: "I wish to call your attention to the fact that Prof. Nelson has made a mistake, I might say a double mistake, in the same article. Referring to bois d' arc he goes on to say 'this popular name was neatly put into Greek by Sargent who called the genus *Toxylon,* now unfortunately superseded according to the rules of priority by Nuttall's much more prosaic *Maclura,* in honor of the early geologist, William

Maclure.' The scientific name for osage orange is *Toxylon pomiferum* Raf. The term Toxylon was applied to this genus by Rafinesque in the 'American Monthly Magazine' in the year 1817, vol. 2, p. 118. Nuttall's *Maclura* was not published until 1818. The second mistake in this statement by Professor Nelson lies in attributing the term *Toxylon* to Sargent who was not yet born when Rafinesque published the term."

Spindle Tree.—One of the most curious and interesting of ornamental shrubs is the Japanese spindle tree (*Euonymus alatus*). Its flowers are small and of no especial beauty, but its branches are winged with from two to four broad ribbons of cork that give it a most unique appearance in any collection of plants, especially during the season when most plants are leafless. In autumn its leaves become blood red and for a considerable time add much color to the shrubberies. The American forms of the spindle tree (*Euonymus atro-purpureus* and *E. Americanus*) are more familiarly known as burning bush, strawberry bush, or wahoo. These have neither handsome flowers nor brilliant foliage, but the fruits, especially those of *E. atro-purpureus*, have pinky-white capsules which, when ripe, open, disclosing the scarlet arils after the manner of its relative, the bittersweet (*Celastrus scandens*) and thus give a distinctive note of color to our autumn woods.

Proliferation of Calendula.—We have received from Mrs. Nellie W. Masson of Indianapolis, an interesting flower-head of pot marigold (*Calendula*) in which one of the florets, instead of blooming like the rest, has produced a stem nearly three inches long with a smaller though perfect flower-head of its own. This is an additional proof of the fact, long known, that the flower is essentially a transformed branch. All the floral organs can be shown to be leaflike in origin. This being the case it is not strange that on occasion the flower should display branchlike characteristics. Such occurrences, however, are always worth reporting. The common geranium (*Pelargonium*) often produces a second truss of flowers from the midst of the first ones.

The Yucca Moth.—The orchids have long been famous for the methods they have adopted to secure pollination by insects. Probably no other flowers have been so greatly modified in form for this purpose, but so far as insect ingenuity, itself, is concerned, the prize must go, not to the insects that visit tropical orchid flowers, but to a rather inconspicuous denizen of our own fields and woods, the yucca moth (*Pronuba yuccasella*). This insect, by means of a stout ovipositor, lays her eggs in the young seed capsule of the yucca plant at the time the flowers are blooming and the larvae, when hatched, feed on the developing yucca seeds. The Yucca, however, owing to the location and shape of its stigma, is incapable of self pollination, or even of being pollinated by ordinary flower-loving insects, and would therefore set no seeds were it not for the ministrations of the moth. During the yucca's blooming season, this remarkable insect may be seen just at dusk running rapidly up one stamen after another and scooping out the pollen which she makes into a tiny ball and holds between her head and the lower side of her thorax. Flying usually to another flower with her load, she first lays an egg in the ovary and then climbing up to the stigma deliberately pollinates the flower by pushing the pollen down into the stigmatic cavity with much vigor. The larvae remain in the seed capsules until mature and then crawling out, burrow into the earth where they make a silken cocoon in which they rest until the yuccas bloom again. When the first yucca blossom opens, the moth soon finds it and during the entire blooming season remains in the blossoms, changing to new flowers as the old ones fade. So closely do the moths resemble the thick stamens that they may frequently be overlooked by those not in the secret. Where the yucca grows wild, it is of course never without its attendant moth, otherwise the family line would soon run out. In cultivation it may frequently be absent, though wherever the plant sets seeds without assistance from man, the moth is sure to be present, and the round holes in the seed capsules, through which the mature larvae escape, are further evidences of the

fact. The yucca has a three-celled capsule and each cell contains many seeds so that although the larvae eat many seeds, there is always sufficient left to reproduce the plant. Nobody seems to know what happens to the moth in an off year when the yuccas fail to flower. Probably a good many die and thus nature keeps the moth within bounds and up to date as a pollinator.

Ornamental Shrubs.—One who would have his grounds as attractive as possible must exercise considerable discrimination in selecting his plants. Too often one yields to the temptation to plant shrubs that shall present an attractive appearance at flowering time only, whereas, if more thought were given to the matter, equally fine plants could be selected that would possess much beauty at other times. There are always sufficient flowers when the great burst of bloom is on in May, but often there is a conspicuous lack both earlier and later. By judicious planting one may, however, have flowers both early and late, and bright colors always. Early spring brings the golden bell, corylopsis and garland flower (*Daphne*) while some species of dogwood and willow vie with them in color. In late summer there are the rose-of-Sharon, blue sage (*Caryopteris mastacantha*), butterfly bush, pea tree, abelia, hercules club and various others. Even autumn is not without its blooming shrubs and the witch hazel often flowers in November. The brightest colors of this latter season, however, are given by leaves, berries and bark. The bright red of barberry, high bush cranberry, and hawthorn, the orange and red of bittersweet, and the clear white of snowberry, are more conspicuous after the leaves have fallen, but the most brilliant reds of autumn are due to the colors put on by the leaves of sumach, chokeberry, barberry, and young plants of the wild crab. If nurserymen were to give somewhat more emphasis to the good points that shrubs possess in addition to flowers, it is probable that a more extensive business would result.

EDITORIAL

In an effort to save transportation, labor, coal, and other supplies the War Industries Board has called for a sharp reduction in the amount of paper used in the printing industries. Magazines and newspapers are required to reduce the tonnage used, by printing on thinner paper, reducing the number of pages, adopting narrower margins, using smaller type, stopping all subscriptions as soon as they expire, and cutting off all free copies. The publishing of new books and the starting of new magazines is forbidden until the war is over. This magazine is heartily in favor of anything that will contribute to the winning of the war, and should these rules be in force when our next volume begins, we shall of course, be guided by them, but it should be understood that the basis upon which we take subscriptions is four numbers of 40 pages each for $1.25 and if we are prevented from printing the usual number of pages next year, we will, at the first opportunity make up the lack. Our subscribers, therefore, may renew in the full assurance that they will receive the usual amount of matter for their money. We trust that all will feel that the magazine is worthy of continued support and renew promptly.

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The War Industries Board has also ordered all publishers to abolish their exchange lists. This magazine has no exchange list in the usual meaning of that term. Copies are

sent to a few editors in exchange for their own publications because, being people of intelligence, each wants to see what the other is doing. It would, of course, be possible for each editor to send cash for the other's publication, but this would simply use up more paper, envelopes and postage and increase the transportation problem. Those who exchange dollar publications for ours and wish to observe the strict letter of the law, may send us an extra 25 cents to make things even, if it will make them feel any better—but we do not anticipate any great increase in income from this source.

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In common with other magazines, we annually receive a considerable number of subscriptions for a single year. Some of these subscribers renew and some do not. To compensate us for the trouble of recording new names and correcting our mailing list, the annual subscriber naturally pays a higher rate. When the subscriber saves our time and his by paying for two years in advance, we make a reduction of 50 cents. If he chooses to become a "permanent" subscriber, asking that the magazine be sent until it is ordered discontinued, he pays at the rate of $1.00 a year thereafter. To get on the Patron's list one must now own a full set of the magazine. There are only 35 chances to get on this latter list because we have only 35 more full sets. Anybody who has been thinking of ordering a full set should consider the idea of making himself a Christmas present of one.

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The war has served to emphasize the virtues of walnut, in positions requiring strength, straightness of grain and freedom from warping. The use of this wood in gun-stocks and aeroplane propellers has so greatly reduced the supply that Governor

Brumbaugh of Pennsylvania set aside Friday, October 18th, as Walnut Tree Planting Day. On that day all residents of Pennsylvania were urged to plant walnuts. This example is worth following by other commonwealths, but citizens of other States need not wait for executive action to begin the work. Owing to the long taproot and few lateral roots, young trees are difficult to transplant though this can be accomplished. The best way, however, is to get the nuts, still in their yellow-green hulls and plant them where trees are desired. The boy scouts ought to take this scheme up with great enthusiasm; walnut planting is likely to benefit them rather more than other members of the community. The nuts should be planted about four inches deep. During the past few years, the walnuts in some parts of the Middle West, and perhaps elsewhere, have been entirely defoliated by a hairy caterpillar somewhat larger than the tussock moth. The trees do not recover from such attacks as some other species do and, if the supply of walnut is to be guaranteed in the future, the trees will have to be protected as well as planted, and this right promptly.

BOOKS AND WRITERS

There are many ways of multiplying desirable plants that only the practical plant grower knows anything about. The experienced gardener, confronted with an unfamiliar plant, knows almost instinctively the best way to propagate it. Those who lack this kowledge will be well on the way to acquiring it after reading "Commercial Plant Propagation" by Alfred C. Hottes, assistant Professor of Horticulture at Ohio State University. The whole subject is covered in a very exhaustive manner, whether seeds, buds, bulbs, grafts or other cuttings are discussed. In many cases a number of ways of doing a thing are described, enabling the plant propagator to choose his

method. A special chapter is devoted to the propagation of apples, pears, peaches, and other orchard fruits. Another chapter is devoted to the so-called "florist's flowers" and the book ends with an alphabetical list of trees and shrubs with the best ways of propagating them indicated. The book contains 180 pages and more than 100 illustrations, and is published by the A. T. DeLa Mare Company, New York.

Professor William Alphonse Murrill, well known for his publications on American Fungi, has struck out in a new direction by publishing a book for young people with the title of "Billy, the Boy Naturalist". The "Billy" of the book is the author himself and the experiences he relates are such as might befall any healthy country boy interested in everything about him. None of the incidents described would be called thrilling adventures though to the small boy all must have had more or less excitement in them. Who that has spent part of his youth in the country cannot recall the first rabbit trap, digging artichokes, fishing for eels, gathering pawpaws, or a hundred other activities of similar nature? The incidents are related without much attempt to dress them up and for this reason are all the more interesting. The book ought to be a good one for small boys in any locality. They will undoubtedly enjoy matching their own experiences with Billy's and unconsciously absorb a great deal of information about nature. The book is published by the author at Bronxwood Park, New York City. It contains 250 pages and 43 illustrations and costs $1.50.

At the foundation of all plant and animal breeding are the laws of heredity which as yet are but hazily comprehended by the average person and in many cases are not much more familiar to the student of science. Although the most important single contribution on the subject, and the one which forms the very center of the structure, was announced by Mendel fifty years ago, his researches remained unappreciated until their re-discovery about ten

years ago. Since then the improvement of plants and animals has lost much of its hap-hazard and rule-of-thumb methods and is now proceeding with something of scientific accuracy. Evolution and inheritance, however, are rather complex, and the terminology of the subject has also advanced at a rapid pace, so that the necessity for explanatory texts has become more and more apparent. A step toward supplying the lack has been made by John M. Coulter and Merle C. Coulter with a little book bearing the title "Plant Genetics," put out by the University of Chicago Press. After a discussion of the earlier theories of heredity and the inheritance of acquired characteristics, seven chapters are devoted to different phases of the workings of Mendel's Law. Then come chapters on parthenogenesis, inheritance in gametophytes, self sterility and related subjects. The nature of the work is such that a comprehensive idea of it cannot be given in this notice, but its value to botanists will be apparent when it is known that it approaches the subject from the plant side, while most of the other texts emphasize the animal side. It is clearly and intelligibly written and is further illuminated by forty diagrams and sketches. It is well worth a reading by all who aspire to keep in touch with this important phase of botany. The price is $1.50 net.